Vol. II

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1934

No. 254

PARAMOUNT PUBLIX CORPORATION,
PETITIONER,

vs.

AMERICAN TRI-ERGON CORPORATION

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT

PETITION FOR CERTIORARI FILED AUGUST 6, 1934.

CERTIORARI GRANTED NOVEMBER 5, 1934.

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1. Opinion of the U. S. Court of Customs and Patent Appeals, dated May 25, 1931;
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Sept. 29, 1931. H. VOGT ET AL 1,825,598

PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS

Filed March 29, 1922

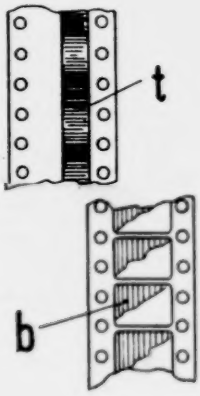

Fig. 1

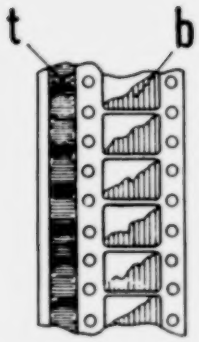

Fig. 2

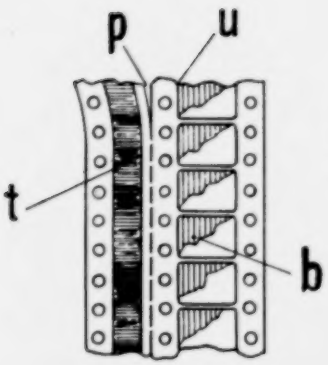

Fig. 3

INVENTOR
Hans Vogt
Joseph Massolle
Josef Engl
BY Munn & Co.
ATTORNEYS

Patented Sept. 29, 1931

UNITED STATES PATENT OFF

HANS VOGT, OF BERLIN-WILMERSDORF, JOSEPH MASSOLLE AND JOSEF E
LIN-GRUNEWALD, GERMANY, ASSIGNORS, BY MESNE ASSIGNMENTS, T
TRI-ERGON CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF

PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FI

Application filed March 29, 1922, Serial No. 547,860, and in Germany April 1

This invention relates to processes for producing combined sound and motion picture films.

In the production of speaking films it is of great advantage especially from the point of view of use, to arrange the sound sequence and the picture sequence upon one and the same piece of material (film).

In this procedure, however, there frequently occur in consequence of the changing lighting conditions in the cinematographing process, changes in the degree of exposure of the silver bromide coating, and this causes the picture sequence to be either overexposed or underexposed.

As the same film, however, carries close to the picture sequence the normally exposed sound sequence, these difficulties resulting from differences in exposure cannot be remedied in the case of combined negatives, by developing practices such as by weakening, strengthening and so forth. They can only be remedied by subjecting the underexposed or the overexposed portions of the negative to separate appropriate treatments.

Technically, this treatment is practically impossible so long as the two sequences—picture and sound—are photographed upon the same film strip.

According to the present invention the difficulty is overcome by either employing entirely separate films for the simultaneous photographing of the sound and picture negatives, or films which are connected during the photographing, but which are separated from one another before the developing, then separately developing the negatives if and in the manner required to remedy the difficulties, and then printing both sequences—picture and sound—on the different portions of the same positive film.

The synchronism is assured in both cases by the perforations and/or by corresponding marks. The production of the combined positive film can take place by copying the two negative films—sound and picture—

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931. H. VOGT ET AL 1,825,598

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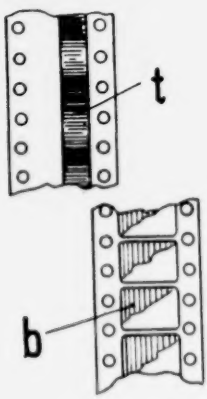

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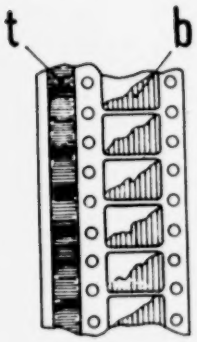

Fig. 2

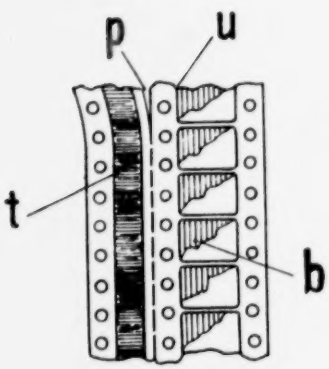

Fig. 3

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Hans Vogt
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Josef Engl
BY Munn & Co.

Patented Sept. 29, 1931

1,825,598

UNITED STATES PATENT OFFICE

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PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS

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In this procedure, however, there frequently occur in consequence of the changing lighting conditions in the cinematographing process, changes in the degree of exposure of the silver bromide coating, and this causes the picture sequence to be either overexposed or underexposed.

As the same film, however, carries close to the picture sequence the normally exposed sound sequence, these difficulties resulting from differences in exposure cannot be remedied in the case of combined negatives, by developing practices such as by weakening, strengthening and so forth. They can only be remedied by subjecting the underexposed or the overexposed portions of the negative to separate appropriate treatments.

Technically, this treatment is practically impossible so long as the two sequences—picture and sound—are photographed upon the same film strip.

According to the present invention the difficulty is overcome by either employing entirely separate films for the simultaneous photographing of the sound and picture negatives, or films which are connected during the photographing, but which are separated from one another before the developing, then separately developing the negatives if and in the manner required to remedy the difficulties, and then printing both sequences—picture and sound—on the different portions of the same positive film.

The synchronism is assured in both cases by the perforations and/or by corresponding marks. The production of the combined positive film can take place by copying the

In the drawing:

Figure 1 shows the two records, the sound record and the picture record, separately.

Figure 2 shows a combined record, and

Figure 3 shows a modified form of the same.

If for the record two separate films with standard perforations are used two negatives are produced as shown in Fig. 1. The sound-record comprises the row of tones *t*, the picture record comprises the row of pictures *b*. The tone row is preferably arranged near one edge of the film. The two negatives are then copied on a single film as shown in Fig. 2. If for the two records a common film is used, this has preferably the form shown in Fig. 3. This film comprises between two rows of perforations the picture record *b* and the sound record *t*. Before the developing, the film is separated at *p* or at *u*. If the sounds have to be recorded at the side of the picture record, outside one row of perforations, a film strip like the one shown in Fig. 2 is produced on which the picture record is between two rows of perforations whilst the sound record is arranged at one edge of the film strip, outside the corresponding row of perforations.

One can, however, previous to the printing, unite longitudinally together the two developed negative films, and then copy this so united negative in the usual manner.

Other benefits may also be derived from the broader aspects of the invention, i. e., from employing separate or separable film areas for the recording of the sound and picture negatives, and then printing both the sound and picture sequences on different portions of the same positive film.

In the following claims where reference is made to a "length of film" upon which a sound record is recorded, such "length of film" shall be interpreted as referring to a strip of film which may be either entirely separate from or merely separable from the film strip carrying the picture se-

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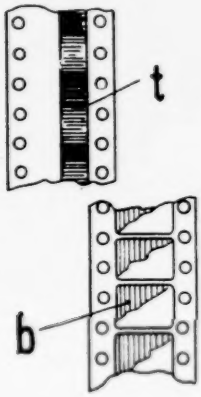

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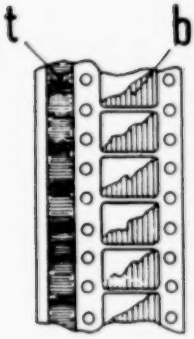

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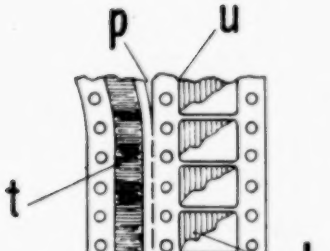

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ATTORNEYS

UNITED STATES PATENT OFFICE

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In this procedure, however, there frequently occur in consequence of the changing lighting conditions in the cinematographing process, changes in the degree of exposure of the silver bromide coating, and this causes the picture sequence to be either overexposed or underexposed.

As the same film, however, carries close to the picture sequence the normally exposed sound sequence, these difficulties resulting from differences in exposure cannot be remedied in the case of combined negatives, by developing practices such as by weakening, strengthening and so forth. They can only be remedied by subjecting the underexposed or the overexposed portions of the negative to separate appropriate treatments.

Technically, this treatment is practically impossible so long as the two sequences—picture and sound—are photographed upon the same film strip.

According to the present invention the difficulty is overcome by either employing entirely separate films for the simultaneous photographing of the sound and picture negatives, or films which are connected during the photographing, but which are separated from one another before the developing, then separately developing the negatives if and in the manner required to remedy the difficulties, and then printing both sequences—picture and sound—on the different portions of the same positive film.

The synchronism is assured in both cases by the perforations and/or by corresponding marks. The production of the combined positive film can take place by copying the two negative films—sound and picture—preferably consecutively upon the same positive film.

In the drawing:

Figure 1 shows the two records, the sound record and the picture record, separately.

Figure 2 shows a combined record, and

Figure 3 shows a modified form of the same.

If for the record two separate films with standard perforations are used two negatives are produced as shown in Fig. 1. The sound-record comprises the row of tones *t*, the picture record comprises the row of pictures *b*. The tone row is preferably arranged near one edge of the film. The two negatives are then copied on a single film as shown in Fig. 2. If for the two records a common film is used, this has preferably the form shown in Fig. 3. This film comprises between two rows of perforations the picture record *b* and the sound record *t*. Before the developing, the film is separated at *p* or at *u*. If the sounds have to be recorded at the side of the picture record, outside one row of perforations, a film strip like the one shown in Fig. 2 is produced on which the picture record is between two rows of perforations whilst the sound record is arranged at one edge of the film strip, outside the corresponding row of perforations.

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Other benefits may also be derived from the broader aspects of the invention, i. e., from employing separate or separable film areas for the recording of the sound and picture negatives, and then printing both the sound and picture sequences on different portions of the same positive film.

In the following claims where reference is made to a "length of film" upon which a sound record is recorded, such "length of film" shall be interpreted as referring to a strip of film which may be either entirely separate from or merely separable from the film strip carrying the picture sequence.

While the invention has been described in detail with respect to certain particular preferred examples thereof which give satis-

factory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:—

1. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so as to expose the last mentioned length of film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each, and printing from both negatives upon the same side of a single integral transparent sensitized film, the coating of which is all of the same character, to form the sound sequence at one side of, and parallel to, the picture sequence.

2. A process for producing a combined sound picture positive film, for talking moving pictures, comprising, simultaneously photographing, on parallel lengths of a single film, a sequence of pictures on the one length of film, and on the other length of film a corresponding sequence of sounds accompanying the action, so as to expose the film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, separating the two lengths of film, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each, and printing from both negatives upon the same side of a single integral transparent sensitized film, the coating of which is all of the same character, to form the sound sequence at one side of, and parallel to, the picture sequence.

3. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film.

4. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon the marginal edge and the sprocket perforations thereof.

5. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the two negatives in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to form the sound sequence at one side of and along the picture sequence.

6. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to form the sound sequence at one side of and along the picture sequence.

7. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon the same face of the same sensitized film at different longitudinally extending portions thereof, to form the sound sequence at one side of and along the picture sequence.

8. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing said negative picture record upon a portion of a sensitized film not exposed to a sound record, and photographing the negative sound record on the same face of said last film and at a portion thereof not exposed to the picture record.

9. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing

sound record on the same face of said last film and at a portion thereof not exposed to the picture record, said last two photographing steps being performed consecutively.

10. A process for producing a combined sound and picture positive film, for sound motion pictures, comprising, photographing a sequence of pictures on one length of film, and photographing on another length of film a corresponding sequence of sound vibrations to accompanying the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

11. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

HANS VOGT.
JOSEPH MASSOLLE.
DR. JOSEF ENGL.

CERTIFICATE OF CORRECTION.

Patent No. 1,825,598. Granted September 29, 1931, to

HANS VOGT ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 11, claim 10, for the word "accompanying" read accompany; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of December, A. D. 1931.

(Seal)

M. J. Moore,
Acting Commissioner of Patents

factory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:—

1. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so as to expose the last mentioned length of film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each, and printing from both negatives upon the same side of a single integral transparent sensitized film, the coating of which is all of the same character, to form the sound sequence at one side of, and parallel to, the picture sequence.

2. A process for producing a combined sound picture positive film, for talking moving pictures, comprising, simultaneously photographing, on parallel lengths of a single film, a sequence of pictures on the one length of film, and on the other length of film a corresponding sequence of sounds accompanying the action, so as to expose the film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, separating the two lengths of film, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each, and printing from both negatives upon the same side of a single integral transparent sensitized film, the coating of which is all of the same character, to form the sound sequence at one side of, and parallel to, the picture sequence.

3. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film.

4. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film between the marginal edge and the sprocket perforations thereof.

5. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the two negatives in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to form the sound sequence at one side of and along the picture sequence.

6. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to form the sound sequence at one side of and along the picture sequence.

7. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon the same face of the same sensitized film at different longitudinally extending portions thereof, to form the sound sequence at one side of and along the picture sequence.

8. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing said negative picture record upon a portion of a sensitized film not exposed to a sound record, and photographing the negative sound record on the same face of said last film and at a portion thereof not exposed to the picture record.

9. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing said negative picture record upon a portion of a sensitized film not exposed to a sound record, and photographing the negative

sound record on the same face of said last film and at a portion thereof not exposed to the picture record, said last two photographing steps being performed consecutively.

10. A process for producing a combined sound and picture positive film, for sound motion pictures, comprising, photographing a sequence of pictures on one length of film, and photographing on another length of film a corresponding sequence of sound vibrations to accompanying the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

11. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

HANS VOGT.
JOSEPH MASSOLLE.
DR. JOSEF ENGL.

CERTIFICATE OF CORRECTION.

Patent No. 1,825,598. Granted September 29, 1931, to

HANS VOGT ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 11, claim 10, for the word "accompanying" read accompany; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of December, A. D. 1931.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

DISCLAIMER

1,825,598.—*Hans Vogt*, Berlin-Wilmersdorf, and *Joseph Massolle* and *Josef Engl*, Berlin-Grunewald, Germany. PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS. Patent dated September 29, 1931. Disclaimer filed November 23, 1932, by the assignee, *American Tri-Ergon Corporation*.

Hereby enters this disclaimer to that part of the claim which it does not choose to claim or hold by virtue of the patent or said assignments, to wit:

(*a*) The process as set forth in claim 6, except wherein the picture and sound negatives are separate films at the time of development.

(*b*) The process as set forth in claim 7, except wherein the sequence of pictures is photographed upon a film separate from that upon which the sequence of sounds is photographed, and the picture and sound negatives are separately developed, in a manner appropriate for each, and are consecutively printed upon the same sensitized film.

[*Official Gazette December 13, 1932.*]

1414

Plaintiff's Exhibit No. 2.

U. S. Patent Office

Recorded
U. S. Patent Office
Issue Division
Nov 23 1932

Nov 23 1932

Issue Division Liber 1 Page 916

DISCLAIMER.

1415

TO THE HON. COMMISSIONER OF PATENTS:

Your petitioner, American Tri-Ergon Corporation, a corporation organized and existing under the laws of the State of New York and having a place of business in the City, County and State of New York, represents that in the matter of certain improvements in Process for Producing Combined Sound and Picture Films, for which Letters Patent of the United States No. 1,825,598 were granted on September 29, 1931, to said
1416 American Tri-Ergon Corporation, as assignee by mesne assignments of the inventors, Hans Vogt, Joseph Massolle and Josef Engl, said corporation is the owner of the entire right, title and interest under an assignment dated June 6, 1930 and recorded in the Transfers of Patents of the United States Patent Office, July 3, 1930, Liber T 144, pages 192 to 199, and other assignments referred to in said assignment, and that your petitioner has reason to believe that through inadvertence and without any fraudulent or deceptive intention, the specification and claim of said Letters Patent are too broad, including that

Plaintiff's Exhibit No. 2. 1417

of which said inventors were not the first inventors. Your petitioner therefore hereby enters this disclaimer to that part of the claim which it does not choose to claim or hold by virtue of the patent or said assignments, to wit:

(a) The process as set forth in claim 6, except wherein the picture and sound negatives are separate films at the time of development.

(b) The process as set forth in claim 7, except wherein the sequence of pictures is photographed 1418
upon a film separate from that upon which the sequence of sounds is photographed, and the picture and sound negatives are separately developed, in a manner appropriate for each, and are consecutively printed upon the same sensitized film.

Signed at New York, in the County of New York, and State of New York, this 22 day of November, 1932.

AMERICAN TRI-ERGON CORPORATION 1419
By (Signed) WM. FOX
WILLIAM FOX

(Corporate Seal)

Witness:
DANIEL G. ROSENBLATT

State of New York, }
County of New York, } ss.:

On this 22 day of November, 1932, before me personally came WILLIAM FOX, to me known,

1420 *Plaintiff's Exhibit No. 2.*

who being by me duly sworn, did depose and say that he resides in Woodmere, New York; that he is the President of American Tri-Ergon Corporation, the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

1421

DANIEL G. ROSENBLATT
Notary Public, New York County
New York County Clk's No. 164
Reg. No. 1R238
Term expires March 30, 1934

(Notarial Seal)

1422

PLAINTIFF'S EXHIBIT No 3

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the File Wrapper and Contents, in the matter of the

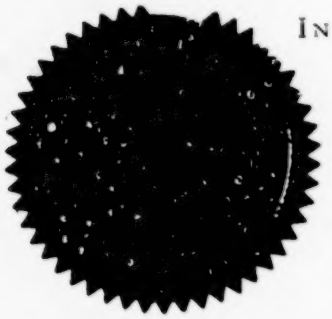
Letters Patent of

Hans Vogt, Joseph Massolle and Josef Engl, Assignors, by Mesne Assignments, to American Tri-Ergon Corporation,

Number 1,825,598, Granted September 29, 1931,

for

Improvement in Processes for Producing Combined Sound and Picture Films.



IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this second day of November, in the year of our Lord one thousand nine hundred and thirty-two and of the Independence of the United States of America the one hundred and fifty-seventh.

ATTEST:

J. T. Sullivan
Chief of Division.

Thomas E. Robertson
Commissioner of Patents.

11—5628
U. S. GOVERNMENT PRINTING OFFICE

1825598

APPLICATION NUMBER (Series of 1913), 547850 — 1[illegible]92 — (EX'R'S BOOK) 81-7

DIV. 7

PATENT No. 1825598

Name① Hans Vogt, ② Joseph Massolle & ③ Josef Engl Assors. to Tri-Ergon Limited, Zürich, Switzerland. Erik) by mesne assigntes, to American Tri-Ergon Corporation of New York, N.Y. a corp. of New York

of ① ② ③ Berlin-Wilmersdorf & Berlin-Grunewald

County of

State of ① ② ③ Germany

Invention Process for Producing Combined Sound Picture Films

ORIGINAL			RENEWED	
Petition	Mar 29	192	Certificate of Correction	192
Affidavit	" "	192	December 22 1931	192
Specification	" "	192	1/3/30	192
Drawing		192		192
Photo Copy	JUN 2 1925	192		192
First Fee $15	Mar 29	192	Disclaimer Filed	192
Appl. filed complete	Mar 29	192	November 23, 1932	192

APPLICATION FILED

Examined and Passed for Issue July 16, 1931

[signature] Exr. Div. 7

Notice of Allowance JUL 16 1931 192 — By Commissioner

Final Fee $25 Sept 192

SEP 29 1931

Patented

Attorney ~~Fitzpatrick & Co. 625 F St. N.W. Wash. City~~

Associate Attorney Richard Crosby, ~~Washington, D.C.~~ 225 Broadway New York N.Y.

No. of Claims Allowed 11 Print Claim 5 in O.G. (Cl. 88-16.2)

Title as Allowed Process for Producing Combined Sound and Picture Films

Issued April 19, 1932

MAR 23 1922 C.C.U.S.PAT.OFFICE

P E T I T I O N

Case X-X 1

TO THE COMMISSIONER OF PATENTS:

Your petitioners, HANS VOGT, resident of Berlin-Wilmersdorf, Germany, JOSEPH MASSOLLE and JOSEF ENGL residents of Berlin-Grunewald, Germany, citizens of the German Republic, whose post-office Addresses are, HANS VOGT, 49 Babelsbergerstrasse, Berlin-Wilmersdorf, Germany, JOSEPH MASSOLLE. 60 Cunostrasse, Berlin-Grunewald. Germany. JOSEF ENGL 58 Hohenzollerndamm, Berlin-Grunewald, Germany, pray that Letters Patent may be granted to them for PROCESS FOR PRODUCING COMBINED SOUND and PICTURE FILMS as set forth in the annexed specification, and they hereby appoint Charles E. Munn & Orson D. Munn constituting the firm of Munn & Co. of the cities of New York, N.Y. Washington, D.C. Chicago, Ill. and San Francisco, Calif., as their Attorneys with full power of substitution and revocation, to prosecute the above-entitled application, to make alterations and amendments therein, to receive the Patent, to transact all business in the Patent Office connected therewith, and to sign their name to the drawings.

Signed at Berlin, Germany by the said Hans Vogt this 9th day of March 1922.

Hans Vogt

Signed at Berlin, Germany by the said Joseph Massolle this 9th day of March 1922.

Joseph Massolle

Signed at Berlin, Germany by the said Josef Engl this 9th day of March 1922.

Dr. Josef Engl.

TO ALL WHOM IT MAY CONCERN :

Be it known that we HANS VOGT JOSEPH MASSOLLE and JOSEF ENGL, citizens of the German Republic and residents respectively the first of Berlin-Wilmersdorf the second and third of Berlin-Grunewald, Germany, have invented a new and improved

PROCESS FOR PRODUCING COMBINED SOUND PICTURE FILMS

of which the following is a full, clear and exact description.

This invention relates to processes for producing combined sound and motion picture films.

In the production of speaking films it is of great advantage especially from the point of view of use, to arrange the sound sequence and the picture sequence upon one and the same piece of material (film).

In this procedure, however, there frequently occur in consequence of the changing lighting conditions in the cinematographing process, changes in the degree of exposure and the bromide coating of silver layer, and this causes the picture sequence to be either overexposed or underexposed.

As the same film, however, carries close to the picture sequence the normally exposed sound sequence, difficulties resulting from these differences cannot be remedied in the case of combined negatives, by developing, weakening, strengthening and so forth. They can only be remedied by subjecting the underexposed or the overexposed negative places to separate appropriate treatments.

Technically, this treatment is practically impossible so long as the two picture and sound sequences are photographed upon the same film strip.

According to the present invention the difficulty is overcome by either employing entirely separate films for the simultaneous photographing of the negatives, or films which are connected during the photographing, but which are separated from one another before the developing.

The synchronism is assured in both cases by the perforations and/or by corresponding marks. The production of the combined positive films can take place by copying the two negative films sound and picture preferably consecutively upon the same positive film.

One can however, also unite previously the two negative films longitudinally together, and then copy this so united negative in the usual manner.

We claim:

1. Process for the production of combined sound and picture films, in which the sound sequence and picture sequence positives are copied upon single film, characterised by the feature that the respective negatives have been developed separately.

2. Process for the production of combined sound and picture films according to claim 1, characterised by the feature that the photographing of the sound sequence and of the picture sequence takes place on separate films.

3. Process for the production of combined sound and picture films as set forth in claim 1, characterised by the feature that the photographing of the sound sequence and of the picture sequence takes place upon a single film and subsequently divided.

4. Process for the production of combined sound and picture films as set forth in claim 1 to 3, characterised by the feature that the negatives after development are re-united.

Hans Vogt
Joseph Massolle
Dr. Josef Engl

Witnesses:
Bruno Klarwerk
John W. Bobby

O A T H.

HANS VOGT, resident of Berlin-Wilmersdorf, Germany, JOSEPH MASOLLE and JOSEF ENGL, residents of Berlin-Grunewald, Germany, the above named petitioners being duly and severally sworn depose and say: that they are citizens of the German Republic; that they verily believe themselves to be the original, first and joint inventors of the PROCESS FOR PRODUCING COMBINED SOUND PICTURE FILMS described and claimed in the annexed specification, that they do not know and do not believe that the same was ever known or used before their invention or discovery thereof, or patented or described in any printed publication in any country before their invention or discovery thereof, or more than two years prior to the above-entitled application; or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by them or their legal representatives or assigns more than twelve months prior to the above-entitled application; and that no application for patent on said improvement has been filed by them or their representatives or assigns in any country foreign to the United States,

except as follows:

Germany, April 14, 1921 (V. 16431 VI/57a 2)

.....James Lloyd.....

.....Joseph Marcello.....

.....Dr. Josef Engl.....

Sworn to and subscribed before me this 9th day of March 1922

C. S. Turrill

Vice Consul of the United States of America

...7 ... Room ...312 ... 2-260 ... V Paper No. ...2...

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON ... April 14, 1922

Munn & Co.

625 F St. N. W.

Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of H. Vogt, et al, filed Mar. 29, 1922, Process for Producing Combined Sound Picture Films, Serial No. 547,860

Thomas E. Robertson

Commissioner of Patents

As the case admits of illustration a drawing is required.

The title should be corrected in the preamble.

Claim 1 is rejected as alternative in that it refers to a plurality of claims.

Claim 2 is for a method in which the sound and picture record are made on separate films.

Claim 3 is for a method in which the records are made on the same film.

Division is required between claim 2 and claim 3, ex parte Eagle 1870 C. D. 137. Claim 1 being generic may be used with either species.

Attention is called to

Bullis 1,335,651 Mar. 30, 1920 88-16.2

W. J. W.

Examiner. 3/4

CRW/S

In re the [illegible]

HANS VOGT, [illegible]
JOSEF ENGL

Process for [illegible]
Films

Filed March 20 [illegible]

Serial No. 5[illegible]

TO THE COMMI[illegible]

SIR:-

[illegible]

1933:-

[illegible]

vention.

[illegible]

Figure 1 [illegible] the sound-record and the picture record, respectively.

Figure 2 shows a combined record, and

Figure 3 shows a modified form of the same.

If for the record two separate films with staggered perforation are used two negatives are produced as shown in Fig. 1. The sound-record comprises the row of tones b, the picture record comprises the row of pictures b. The tone row is preferably arranged near one edge of the film, for the two films with a common film is used, this being the case in Fig. 3. This film comprises between the rows of pictures and the picture record b and the sound

t. Before the developing, the film is separated at p or at u. If the sounds have to be recorded at the side of the picture record, outside one row of perforations, a film strip like the one shown in Fig. 2 is produced on which the picture record is between two rows of perforations whilst the sound record is arranged at one edge of the film strip, outside the corresponding row of perforations.

Erase the claims and insert:-

--Improved process for the ~~production of~~ combined sound and picture records, in which the sound record and the picture record are produced simultaneously on a single film which is then divided and the two parts developed separately, and afterwards re-united and used to print the single positive record.

A drawing is herewith filed.

According to the U.S.A. patent cited 1335651 two separate films are used. The use of separate negatives or of such negatives designed to be separated and the production of a single position record produced from these negatives has however not become known. This characteristic feature of the invention is clearly set forth in the new claim.

Allowance of the case is respectfully solicited.

Respectfully submitted,

HANS VOGT, JOSEPH MASSOLLE,
JOSEF ENGL

per, Munn & Co

Attorneys.

Washington, D.C.,

Nov. 24, 1922.

Dr. Y Room 512

W Paper No. 4

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON April 19, 1923

U. S. PATENT OFFICE APR 19 1923 MAILED

Munn & Co.

625 F St. N. W.

Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of :

Vogt, Massolle and Engl, filed Mar. 29, 1922, Process for Producing Combined Sound and Picture Films, Serial #547,860

Thomas E. Robertson

Commissioner of Patents.

Case reconsidered as amended Nov. 24, 1922.

Applicants having elected to retain only claims specific to the form in which a single film is used and then cut apart, they are required to cancel Fig. 1 and restrict their specification accordingly.

The claim is rejected as not involving invention over Bullis of record. It does not involve invention to make the record on a single film instead of on two films rigidly attached together especially in view of the fact that the single film is afterwards cut apart as the parts of the united film are taken apart.

W J W

Examiner

APPLICATION ROOM
OCT 11 1923
U.S. PATENT OFFICE

Amendment B

#5

CRW/CN.

IN THE UNITED STATES PATENT OFFICE.

Re Application of :

Vogt, Massolle & Engl, : Div. 7. Room 312.

Filed March 29,1922. :

Process for Producing Combined Sound and Picture Films, :

Serial #567,860. :

U. S. Patent Office
OCT 12 1923
DIVISION VII

oooo0oooo

Hon. Commissioner of Patents,

Washington, D.C.,

Sir:-

In response to the Office Letter of April 19,1923.

In the matter inserted at the end of page 2, before "If" line 10, insert --The two negatives are then copied on a single film as shown in Fig. 2.--

Written in B'

Erase the claims and insert:--

Sub C'

1. A positive film for the simultaneous reproduction of picture and sound-phenomenae consisting of one homogenous film band on which the sound records and the picture records, made on two separate negatives and separately developed, are copied

B2

2. A positive film for the simultaneous reproduction of picture and sound-phenomenae consisting of one homogenous film band on which the sound records and the picture records are copied which have been made on a common negative, said records having been separated by cutting and the two strips of film having been developed separately.--

REMARKS

Div. 7 Room 312

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON April 19, 1923

U. S. PATENT OFFICE
APR 19 1923
MAILED

Munn & Co.
625 F St. N. W.
Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of :

Vogt, Massolle and Engl, filed Mar. 29, 1922, Process for Producing Combined Sound and Picture Films, Serial #547,860

Thomas E. Robertson
Commissioner of Patents.

Case reconsidered as amended Nov. 24, 1922.

Applicants having elected to retain only claims specific to the form in which a single film is used and then cut apart, they are required to cancel Fig. 1 and restrict their specification accordingly.

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W J W

Examiner

OCT 11 1923 U.S. PATENT OFFICE

Amendment B

#5

CSW/CN.

IN THE UNITED STATES PATENT OFFICE.

Re Application of :

Vogt, Massolle & Engl, : Div. 7. Room 312.

Filed March 29,1922. :

Process for Producing Combined Sound and Picture Films, :

Serial #547,860. :

oooo0oooo

U. S. Patent Office
OCT 12 1923
DIVISION VII

Hon. Commissioner of Patents,

Washington, D.C.,

Sir:-

In response to the Office Letter of April 19,1923.

In the matter inserted at the end of page 2, before "If" line 10, insert --The two negatives are then copied on a single film as shown in Fig. 2.--

Written in B'

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1. A positive film for the simultaneous reproduction of picture and sound-phenomenae consisting of one homogenous film band on which the sound records and the picture records, made on two separate negatives and separately developed, are copied

Sub C'

B2

2. A positive film for the simultaneous reproduction of picture and sound-phenomenae consisting of one homogenous film band on which the sound records and the picture records are copied which have been made on a common negative, said records having been separated by cutting and the two strips of film having been developed separately.--

R E M A R K S

The new claims herewith are thought to distinguish the invention from the prior art. As previously pointed out in the patent of Bullis, two separate films are

used. We employ a single film having both the sound record and the picture record thereon. To overcome the objection heretofore experienced in forming such films, as pointed out in the specification, two negatives are made and after development, they are copies on a single film, This is new so far as we are aware and it is thought we are entitled to protection for the same. Since Fig. 1 shows the negatives from which the film is made, and in view of the claims presented, it is not thought that Fig. 1 should be cancelled.

A reconsideration and early favorable action is respectfully requested.

Respectfully submitted,

VOGT, MASSOLE, AND ENGL,

By

Attorneys.

#10

MAILROOM
AUG
2
1924
U.S. PATENT OFFICE

UNITED STATES PATENT OFFICE.

HANS VOGT,
JOSEPH MASSOLLE,
JOSEF ENGL,

DOCKET DIVISION
AUG 2 1924
U.S. PATENT OFFICE

Div. 7

Room 312

Serial No. 547,860.

Filed March 29, 1922.

Process for Producing Combined Sound and Picture Films.

Hon. Commissioner of Patents,

Washington, D.C.

Sir:

The undersigned hereby revoke all previous powers of Attorney in connection with the above entitled application.

The undersigned hereby appoint Messrs. Ward, Crosby & Smith, a firm composed of S. Mortimer Ward, Jr., Gorham Crosby and Dyer Smith, (Registration No. 11657), of 233 Broadway, New York, New York, its attorneys, with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent and to transact all business in the Patent Office connected therewith.

Josef Engl.

Joseph Massolle

We agree to the above revocation of our Power of Attorney.

Accepted

MAIL ROOM SEP 27 1924 U.S. PATENT OFFICE

U. S. Patent Office SEP 29 1924 DIVISION VII

Amendment C

#12

IN THE UNITED STATES PATENT OFFICE.

HANS VOGT,
JOSEPH MASSOLLE,
JOSEF ENGL,

Div. 7

Serial No. 547,860,

Room 312.

Filed March 29, 1922.

Process for Producing Combined Sound and Picture Films.

Hon. Commissioner of Patents,

Washington, D.C.

Sir:

In response to Patent Office action of October 15, 1923, please amend the above entitled application as follows:

Cancel the Claims, and substitute the following:

for claim 1 / Sub E 1 / for claim 1 / C 1

---1. A process for producing a ~~x~~ combined sound and picture positive film, for talking moving pictures, ~~sensitized cinematography~~, comprising, simultaneously photographing a sequence of pictures on one length of film and a corresponding sequence of the sound accompanying the action ~~sounds~~ on another length of film, developing the two negatives separately, to give the picture and sound negatives the treatments appropriate for each, and printing from both negatives upon the same side of a single integral transparent sensitized film, the coating of which is all of the same character, to form the sound sequence at one side of, and parallel to, the picture sequence.

for claim 2 / Sub E 2

---2. A process for producing a combined sound and picture positive film, for talking moving pictures, ~~sensitized cinematography~~, comprising, simultaneously photographing, on parallel lengths of a single film, a sequence of pictures

MAILROOM AUG 2 1924 U.S. PATENT OFFICE

UNITED STATES PATENT OFFICE.

HANS VOGT,
JOSEPH MASSOLLE,
JOSEF ENGL,

DOCKET DIVISION
AUG 2 1924
U.S. PATENT OFFICE

Div. 7

Room 312

Serial No. 547,860.

Filed March 29, 1922.

Process for Producing Combined Sound and Picture Films.

Hon. Commissioner of Patents,

Washington, D.C.

Sir:

The undersigned hereby revoke all previous powers of Attorney in connection with the above entitled application.

The undersigned hereby appoint Messrs. Ward, Crosby & Smith, a firm composed of S. Mortimer Ward, Jr., Gorham Crosby and Dyer Smith, (Registration No. 11657), of 233 Broadway, New York, New York, its attorneys, with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent and to transact all business in the Patent Office connected therewith.

Josef Engl

Hans Vogt

Joseph Massolle

We agree to the above revocation of our Power of Attorney.

Munn & Co

Accepted
AUG 5 1924
T. E. Robertson
Commr.

MAIL ROOM SEP 27 1924 U.S. PATENT OFFICE

U. S. Patent Office SEP 29 1924 DIVISION VII

#12

IN THE UNITED STATES PATENT OFFICE.

HANS VOGT,
JOSEF MASSOLLE,
JOSEF ENGL,

Serial No. 547,860,

Filed March 29, 1922.

Process for Producing Combined Sound and Picture Films.

Div. 7

Room 312.

Hon. Commissioner of Patents,

Washington, D.C.

Sir:

In response to Patent Office action of October 15, 1923, please amend the above entitled application as follows:

Cancel the Claims, and substitute the following:

---1. A process for producing a combined talking moving picture sound and picture positive film, for ~~acoustic cinematography~~, comprising, simultaneously photographing a sequence of pictures on one length of film and a corresponding sequence of the sound accompanying the action on another length of film, developing the two negatives separately, to give the picture and sound negatives the treatments appropriate for each, and printing from both negatives upon the same side of a single integral transparent sensitized film, the coating of which is all of the same character, to form the sound sequence at one side of, and parallel to, the picture sequence.

---2. A process for producing a combined sound and picture positive film, for talking moving pictures ~~acoustic cinematography~~, comprising, simultaneously photographing, on parallel lengths of a single film, a sequence of pictures and a corresponding sequence of the sound accompanying the action ~~sounds~~, separating the two

lengths of film, developing the two negatives [illegible] to give the picture and sound negatives the [illegible] appropriate for each, and printing from both negatives [illegible] the same side of a single integral transparent [illegible] film, the coating of which is all of the same [illegible] to form the sound sequence at one side of, [illegible] to, the picture sequence.

REMARKS: Attention is called to [illegible] one of the present attorneys, together with [illegible] inventors, Dr. Engl, with the [illegible] July 16, last. At that time the [illegible] go into the case in detail, but stated that [illegible] give it his personal attention when the [illegible] be made.

In view of the election made by the [illegible] to the form in which the negatives [illegible] single film and then cut apart, it is, of [illegible] possible to claim specifically the form in [illegible] which the negatives are made on two [illegible] 1 submitted herewith is, however, intended [illegible] generic to both of these forms, while claim [illegible] to the form previously elected. The [illegible] the election is thought not to be of [illegible] and it is believed that the election [illegible] previous attorneys because of their [illegible] American practice, the application [illegible] prosecuted from abroad. In any case [illegible] present claim 1 is properly generic.

Furthermore it will be noted that the present claims are process claims, as were the original claims, whereas the claims submitted by the last amendment and now cancelled, were in form drawn to the article. This, however, was not actually a shift from process claims to true article claims, since the so-called article claims were in effect attempts to claim the process, and the Examiner rejected the same as defining an article by the process of making it. It would seem, therefore, that there is no difficulty in this connection.

Referring now to the references, patent to Bullis seems to be closer than patent to Craig. As to the latter Craig did not print from both negatives upon the same side of a single transparent sensitized film, the coating of which is all of the same character, nor did he form the sound sequence at one side of and parallel to the picture sequence. What he was trying to do was to make a picture record on one side which would be pervious to ordinary light, and a sound sequence on the other side, in alignment therewith, which would be pervious to invisible light, such as Infra-red light. He evidently had no thought of developing his two negatives in developing baths, which would be different, and with times of development which should be different, because of the different treatments required for the sound record film and the picture film. His only object in making the two negatives on separate films was apparently convenience, in that he wanted to print on opposite sides of the positive film, and there was, therefore, no reason why the two negatives should be made on the same film, it being simpler to print on opposite sides of the positive from two different

negatives, than from negatives on a single film strip.

In regard to patent to Bullis, he does, of course, make separate negatives and develops them separately. He then, however, makes separate positives, which he either keeps separate from each other or joins them together edge to edge, if desired. If he has two separate positives synchronism between the pictures and sounds will be subject to variation because of possible breaking and rejoining of one film or the other, and because of uneven shrinking of the films, uneven wear of the sprocket holes in the films on the sprocket teeth, etc.

If, on the other hand, Bullis joins the two films together, his joint would have to be an overlapping joint or an edge to edge, or butt joint. In the specification he only speaks of an overlapping joint by cement, page 4, line 60. If this is done, the film will be considerably thickened and stiffened at the joint, both because it has the thickness of the two films where they overlap, and also because it has the thickness of the layer of cement at this point. This thickened joint would be so stiff that the film would be very likely to jump off of the sprocket teeth in going around the curve of the sprocket wheel. Also, the application of the cement to the two films may set up stresses in the films which would be very likely to cause buckling of the films. Also, the films are likely to shrink unevenly after being cemented together, which would cause further strains at the cemented joint, and this would tend to cause buckling or even breaking the joint, and cause the two films to become separated from each other at different points, which might cause lateral movement at one point with respect to the other.

Uniform and proper reproductions ~~and~~ of the sounds and pictures would be prevented by these difficulties.

If, instead of a cemented joint the overlapped films were fastened together by rivets, or clips, or the like, the same difficulties, generally speaking, would arise, and there would be the further likelihood of these fastening devices working loose and forming projections which would rattle against the sprocket teeth, etc. The patentee does not speak of the possibility of forming an edge to edge or butt joint between the two films, and this method of joining the two together is probably impractical, or less practical than the overlapping joint. It may be conceivable that the two films could be fastened together edge to edge by some form of clips, but it might be difficult to prevent relative movement between the two films in such a case. If a butt joint were effected, the film would certainly be stiffened at the points where the edges were fastened together, and this stiffening would result in the film tending to spring away from the sprocket teeth at the points where the clips pass over the sprockets, and this might cause the film actually to jump off of the sprockets at such points. Furthermore these clips would rattle over the sprockets and might cause strain on the film by catching against the ends of the sprocket teeth, unless the clips were carefully countersunk in the body of the film, the film, however, being insufficient in thickness to make this practical

It will, therefore, be seen that the process claimed in Claim 1 herein distinguishes fully from Bullis in stating that applicants print from both negatives upon the same side of a single integral transparent sensitised film.

While this may not seem a large matter, after the step has been taken, it should nevertheless be noted that the taking of this step makes the difference between failure and success in this instance, since Bullis' construction is obviously practical. What applicants have done amounts to invention, and to more than something which would be obvious to the traditional man skilled in the art, as is instanced by the fact that Bullis did not see the necessity of printing the two records on the one film, and none of the other workers in this field have apparently seen this necessity. The Bullis application was filed nine years ago, and his patent has been out for a number of years.

Claim 2 submitted herewith is specific to the form of process in which the negatives are made simultaneously side by side on parallel portions of a single film, which is then separated lengthwise, the two negatives developed, etc., the same as in the other case. This is specifically novel and the advantage is attained that the two negatives are necessarily in exact synchronism. The claim additionally has the same distinctions as Claim 1 already discussed.

In further reference to Claim 1, it will be evident that the two references, Bullis and Craig, cannot be combined together to anticipate the claim, since they are manifestly of such a character that it is impossible to combine the two. Furthermore the claim distinguishes in various limitations from both of the references. It is believed that applicants have made an advance in the art of considerable practical value, and that in view of the

novelty of the process, and the

practical procedure has for the first

effectively the separate development

of the two films, and their combination

invention is clearly

accordingly, an allowance is requested.

Respectfully submitted,

HANS VOGT,
JOSEPH MASSOLLE,
JOSEF ENGL

By Ward Curtis and Smith
Their Attorneys.

, N.Y. U.S.A.

-7-

Div. 7 Room 312 — 2 — AKF/AH — Paper No. 13.

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON January 26, 1925.

PATENT OFFICE, JAN 26 1925 MAILED

Ward, Crosby & Smith
233 Broadway
New York City.

Please find below a communication from the EXAMINER in charge of the application of

Hans Vogt et al; Serial No. 547,860; filed March 29, 1922;
for PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

Thomas E. Robertson
Commissioner of Patents

The amendment filed September 27, 1924 is of record.

Claims 1 and 2 are rejected on

GREENSFELDER, 1,254,684, Jan. 29, 1918, (88-16.2)
or MASSOLLE (Brit.), 157,751, Feb. 1921, (88-16.2)
(no drawing).

Note page 3, line 128 to page 4, line 8 and page 5, line 128 to page 6, line 4, of Greensfelder. In the device of Massolle the pictures are taken and developed separately and then reproduced upon a single film.

R. G. Parker
Examiner, Div. 7.

J.

Amendment filed
4/14

APPLICATION FILED APR 1 1925 U.S. PATENT OFFICE

U. S. Patent Office
APR 2 1925
DIVISION VII

1432

IN THE UNITED STATES PATENT OFFICE.

In re application of

Hans Vogt, Joseph Massolle and Josef Engl.

Serial No. 547,860,

Filed March 29, 1922,

Process for Producing Combined Sound and Picture Films.

Div. 7,

Room 312

New York, N. Y.,

March 31, 1925.

Hon. Commissioner of Patents,
Washington, D. C.

S i r :

In response to Patent Office action of January 26, 1925, please amend the above entitled application as follows:

Claim 1, line 2, cancel "acoustic-cinematography" and substitute - talking moving pictures - . Line 5, cancel "sounds" and substitute - the sounds accompanying the action -

Claim 2, line 2, cancel "acoustic-cinematography" and substitute - talking moving pictures - . Line 5, cancel "sounds" and substitute - the sounds accompanying the action -

Add the following claims:

3. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film .

1919 C D 65-

pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film between the marginal edge and the sprocket perforations thereof.

REMARKS.

The Massolle British reference, No. 157,751, is not a patent, since the complete specification was not accepted and the application has become void as is noted on the face of the printed patent specification. This British application was filed by the same three inventors as the present application. It is available as a publication merely, and it is a publication of a date at least no earlier than February 2, 1921, on which date, according to the records in the Scientific Library, this British specification was opened to public inspection. Inasmuch as this is not a printed publication more than two years prior to the present application, it is evident that it is not a reference against it.

The Greensfelder patent, No. 1,254,684, does not simultaneously photograph the pictures and the sounds accompanying the action in the production of films for talking moving pictures. It is thought that the problems with which applicants are concerned did not arise in the case of this reference.

Further discussion of this reference seems unnecessary in view of the fact that broader claims than those

3/26

which have been contained herein are contained in patent No. 1,489,314, granted to Lee de Forest, on April 8, 1924, for Recording Sound. It appears that claims 1 and 3 of this patent can be made herein, and these claims are added hereto by the present amendment as claims 3 and 4. An interference with the said patent at an early date is requested.

Respectfully submitted,

HANS VOGT, JOSEPH MASSOLLE and JOSEF ENGL.

By Ward, Crosby and Smith
Their Attorneys

DB.AM

Room 312

Address only "The Commissioner of Patents, Washington, D.C." and not any official by name

2-' 160 AKF-AH Paper No. 28.15.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

WASHINGTON April 6, 1925.

Ward, Crosby & Smith
233 Broadway
New York City.

PATENT OFFICE, APR - 6 1925 MAILED

Please find below a communication from the EXAMINER in charge of the application of

Hans Vogt et al; Serial No. 547,860; filed March 29, 1922; for PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

Thomas E. Robertson
Commissioner of Patents.

The amendment filed April 1, 1925 is of record.

Claims 1 and 2 are rejected on Craig, 1,260,337, in view of Greensfelder, 1,254,684, both of record. It is shown to be old in Craig to take separate synchronous sound and picture records simultaneously and to then reproduce these two records on a single record strip. Applicant desires to reprint both records on one side only; but this is the teaching of Greensfelder, note page 3, line 128 to page 4, line 8.

Claims 3 and 4 are rejected as not based on the disclosure of applicant. Applicant takes a sound record and a picture record and reproduces these two records on a third film. These claims, however, call for a sound record and a picture record as does applicant, but the claims then define that the sound record is reproduced on the original picture record strip which is not the method of applicant. If, however, it requires that a positive of the sound record be made and a reprint of this be taken on the original picture strip still it would not be the method outlined by applicant in his specification. The steps are clearly not the same. Referring to the case of the patentee the reference Craig cited in this action [illegible]

a reference against the claims here under consideration, and though the steps in the method of applicant and of Craig are the same yet the claims of patentee were held patentable over Craig. Therefore, it is evident that applicant cannot make the claims of the patentee as applicant does not disclose such a method in his application.

Applicant is accordingly given 30 days in which to reply to this action. Ex parte Weber & Woodford, 1919 C.D. 65; 264 O.G. 863.

F.

Examiner, Div. 7.

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name

Room 312 — 2-'260 — AKF-AH — Paper No. 28.15.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

WASHINGTON April 6, 1925.

Ward, Crosby & Smith
233 Broadway
New York City.

PATENT OFFICE APR - 6 1925 MAILED

Please find below a communication from the EXAMINER in charge of the application of

Hans Vogt et al; Serial No. 547,860; filed March 29, 1922; for PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

Thomas E. Robertson
Commissioner of Patents.

9—3811 G P O

The amendment filed April 1, 1925 is of record.

Claims 1 and 2 are rejected on Craig, 1,260,337, in view of Greensfelder, 1,254,684, both of record. It is shown to be old in Craig to take separate synchronous sound and picture records simultaneously and to then reproduce these two records on a single record strip. Applicant desires to reprint both records on one side only; but this is the teaching of Greensfelder, note page 3, line 128 to page 4, line 8.

Claims 3 and 4 are rejected as not based on the disclosure of applicant. Applicant takes a sound record and a picture record and reproduces these two records on a third film. These claims, however, call for a sound record and a picture record as does applicant, but the claims then define that the sound record is reproduced on the original picture record strip which is not the method of applicant. If, however, it requires that a positive of the sound record be made and a reprint of this be taken on the original picture strip still it would not be the method outlined by applicant in his specification. The steps are clearly not the same. Referring to the case of the patentee the reference Craig cited in this action was held not to be

a reference against the claims here under consideration, and though the steps in the method of applicant and of Craig are the same yet the claims of patentee were held patentable over Craig. Therefore, it is evident that applicant cannot make the claims of the patentee as applicant does not disclose such a method in his application.

Applicant is accordingly given 30 days in which to reply to this action. Ex parte Weber & Woodford, 1919 C.D. 65; 264 O.G. 863.

F.

Examiner, Div. 7.

MAIL ROOM APR 22 1925 U.S. PATENT OFFICE

U. S. Patent Office APR 23 1925 DIVISION VII

Amendment

16

IN THE UNITED STATES PATENT OFFICE.

In re application of
HANS VOGT, JOSEPH MASSOLLE,
and JOSEF ENGL,

Serial No. 547,860, Div. 7,

Filed March 29, 1922, Room 312.

Process for Producing Combined Sound and Picture Films.

New York, N.Y.,

April 17, 1925.

Hon. Commissioner of Patents,
Washington, D. C.

S i r :

In response to Patent Office action of April 6, 1925, please amend the above entitled application as follows:

Claim 1, cancel from the beginning of line 1 through the words "appropriate for each" in line 7, and substitute the following:

- A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so as to expose the last mentioned length of film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each, a

Claim 2, cancel from the beginning of line 1 through the words "appropriate for each" in line 8, and substitute the following:

- X. A process for producing a combined sound picture positive film, for talking moving pictures, comprising, simultaneously photographing, on parallel lengths of a single film, a sequence of pictures on the one length of film, and on the other length of film a corresponding sequence of sounds accompanying the action, so as to expose the film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, separating the two lengths of film, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each.

pen 1
Ex 2

REMARKS

Considering first the rejection of claims 1 and 2 on Craig, in view of Greensfelder. Craig does not print from both negatives on the same side of a sensitized film, the coating of which is all of the same character. What Craig was trying to do was to make a picture record on one side, which would be pervious to ordinary light, and a sound sequence on the opposite side of the film, which would be pervious to invisible light. Further, and this is an important distinc-

tion, Craig had no thought of developing his two negatives in developing baths which would be different and with times of development which should be different because of the different treatments required for the sound record film and the picture film. The only object in making the two negatives on separate films was apparently convenience in that he wanted to print on opposite sides of the positive film and it would be easier to do this when the sound and picture negatives were on separate film strips.

Greensfelder has an entirely different invention, since his object was to optically control connecting mechanisms for mechanical musical instruments, such as piano keys, drums, etc. For this purpose he provided the alternately translucent and dark portions on a reproducing film strip. By means of the selenium cell he is thus enabled to actuate, by means of selected alternately translucent and dark portions of the film strips, a variety of musical instruments, such as the keys of pianos, drums, bells,etc. Each sound mark on his film serves as an entirety to put a separate selenium cell into action to operate a different musical mechanism, such as a separate piano key. He does not at all consider any gradual differences of the darkness of the film, since he only considered throwing in or out of operation a mechanism. In applicants' case, however, the photographic sound record on the film must correspond in minute detail to the various frequencies and intensities of sound having the various overtones and shadings of, for example, the human voice.

Applicants' claims 1 and 2 have carefully been rewritten to bring out this distinction and to make perfectly clear the manner in which the two negatives are given development of different character and length. In Greensfelder there was no need of developing the sound marks and pictures in any different way from each other because of the fact that his sound marks are composed of entirely translucent rectangles, having no gradations which must be properly brought out in development. Applicants found the sound record must be developed in a quite different manner from the picture record. This is brought out in the two claims which are accordingly thought allowable. It is further noted that claim 2 distinguishes further from the art in its specific limitation in that the two negatives are simultaneously photographed on parallel lengths of a single film which is subsequently cut apart. It should, of course, also be noted that Greensfelder does not and cannot produce his so-called "sound marks" simultaneously with the pictures, whereas applicants claims call for the simultaneous photographing of the sound and pictures.

Referring now to the rejection of claims 3 and 4 as not based on applicants' disclosure: The DeForest patent No. 1,489,314 is somewhat ambiguous. It is believed that the claims in question may be susceptible to construction or interpretation and that it is possible that DeForest may subsequently urge such an interpretation of them as would cause them apparently to dominate applicants' in-

vention. The Examiner's own statement indicates that the claims may be interpreted. Not we do not contend that the claims should be interpreted so as to read upon applicants' construction, but we contend that they may be susceptible to this interpretation, and the DeForest patent having been issued, it is no longer within the province of the Examiner to limit the interpretation of these claims, this lying wholly within the province of a Court, and if DeForest should contend for such an interpretation and bring suit for infringement against applicants, and the claims should be so interpreted and upheld, applicants would have lost all rights in the matter. Further under the doctrine in Davis-Bournonville vs. Milburn, 297 F. 654, if applicants did not have a patent claiming substantially the same subject matter as these DeForest claims, applicants' patent could not even be used as prior invention, and since applicants' application was co-pending with DeForest, a patent issued on applicants' application could not be considered as prior art against DeForest. Therefore, if there is any possiblity of the DeForest claims being interpreted to read on applicants' structure, the interference should be declared and applicants allowed the privilege of contesting the question of priority with DeForest. Then if DeForest should wish to contend that his claims have such a meaning that applicants have no right to copy the same, it would be a simple matter for him to bring a motion to dissolve, in which case the construction thus placed upon the claims by him would constitute an estoppel. The decision of the Examiner that these claims

mean something different from applicants' method has, of course, no binding effect upon DeForest. Under these circumstances it is believed that all possible doubts as to the right of applicants to make these claims should be decided in applicants' favor so that the question of the interpretation of the claims may be decided inter partes.

The manner in which these claims may be construed is apparently as follows:

A. If the claims are taken absolutely literally, negatives of the sound and picture are made on separate strips and the sound negative is then printed as a positive on the picture negative. It is obvious that a picture negative would not be used for projection purposes and the claim is therefore incomplete. If a further step be added, a print is then made from this record, which would produce a picture positive and a sound negative. It does not seem likely that this is the meaning of the patentee.

B. Following the suggestion of the Examiner, the claims may mean the following. Negatives of the sound and picture are made on separate strips. A positive of the sound record is then printed on a third strip. A reprint of this sound positive is then made on the original picture producing a sound negative thereon.
negative. These two negatives would then have to be developed together, after which a positive of the two negatives on the one strip would be printed on a fourth strip to produce the combined positives. In accordance with this interpretation of the Examiner four strips would be required. Also the second step, of printing a positive of the sound record on the edge of the picture negative,
on a separate strip, which is to be reprinted as a negative, does not seem to be justified in any way from the disclosure.

The claims state that the sound record is photographed on the picture film, not that a reprint of a positive made from the sound negative is made on the picture film.

C. Another interpretation of the claims is that the two negatives are made on separate strips, after which a positive is made from the picture negative, and this is considered as the picture film. The sound negative is printed on an unexposed portion of this film. That is a process involving the use of three strips. In interpreting the claims in this way, they seem to call for the printing of the picture positive on the final strip before the sound positive is printed thereon. Applicants do not state whether they print the picture or the sound record first on the final strip or whether the order of printing these records is at all material.

The DeForest patent seems to state that it is not material which record is printed first, it being stated on page 1, lines 106 to 108, and page 2, lines 1 and 2, that the sound record is printed on the motion picture film 10, either unexposed as to the marginal edge thereof, or unexposed as to its entire surface.

If DeForest states that his motion picture film may be unexposed as to its entire surface at the moment when the sound record is printed thereon, an inference may be that the motion picture film is intended to mean the film which is adapted to carry the motion pictures and that either the sound record or the picture record may first be printed thereon and the other record printed thereafter.

It is this construction of the claims which caused applicants to copy the claims and to request an

interference. The deForest language referred to perhaps indicates that "the picture film" of the claims is "motion picture film 10" of page 1, line 106, and that this cannot be the original picture negative, since it is stated that its picture spacing may be unexposed when the sound record is printed on it. Reconsideration of the Examiner's holding that applicants have no right to make these claims is requested, and it is further requested that the proposed interference be instituted.

In regard to patentability of deForest over Craig, that is, of course, not now in issue, but only the right of applicants to make the claims. It should also be noted that it is the established Patent Office practice to declare an interference between an application and a patent, if it be held that the applicant has a right to make the claim, without considering the question of patentablity of the claim in the patent, since this was decided when the patent was issued. If applicants can make the claims, it may perhaps be presumed, for the purpose of this interference, that the Examiner so construed deForest's claim, as to make it patentable over Craig, and the claim would then be considered as similarly patentable to applicants, over Craig.

In conclusion it should be noted that little hardship will be imposed upon deForest in bringing a motion to dissolve, once the interference has been declared, if he should consider that the claims are not open to such an interpretation as to enable applicants to make the same. On the other hand, if applicants are not given the right to

enter the interference, an irreparable injury may be caused to applicants if deForest should subsequently believe that he had ground for an infringement suit against the owners of applicants' application and should contend for such a construction of the claims as would enable a charge of infringement to be made out.

Respectfully submitted,

HANS VOGT, JOSEPH MASSOLLE and JOSEF ENGL.

By Ward Crosby and Smith
Their Attorneys

DS.AM

Div. 7 Room 312
Address only "The Commissioner of Patents, Washington, D. C." and not any official by name

2-260 AKF-AH

Paper No. 27.
All communications respecting the application should give the serial number, date of filing, title of invention and name of the applicant

DEPARTMENT OF ~~THE INTERIOR~~ COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON April 27, 1925.

Ward, Crosby & Smith
233 Broadway
New York City.

PATENT OFFICE APR 27 1925 MAILED

Please find below a communication from the EXAMINER in charge of the application of
Hans Vogt et al; Serial No. 547,860; filed March 29, 1922;
for PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

Thomas E. Robertson
Commissioner of Patents.

The amendment filed April 22, 1925 is of record.

Claim 1 is again rejected on Craig, 1,260,337, in view of Greensfelder, 1,254,684, both of record, and for reasons of record. Craig simultaneously takes a picture and a sound record and then developes them on the same film. Applicant's method varies only in that the records are reproduced on the same side of the film but this is what Greensfelder has done and as was pointed out in the last Office action. The rejection of this claim is final, ex parte Miller, 150 O.G. 837.

Claim 2 is allowed, as at present advised.

Claims 3 and 4 are again rejected as having no basis in the disclosure made by applicant as pointed out in detail in the last Office action; since applicant and patentee are not claiming substantially the same subject matter of invention there is no interference and applicant has no right to make such claims.

Applicant is accordingly given 30 days in which to appeal from the rejection of claims 3 and 4, under ex parte Webber and Woodford, 1919 C.D. 65.

enter the interference, an irreparable injury may be caused to applicants if deForest should subsequently believe that he had ground for an infringement suit against the owners of applicants' application and should contend for such a construction of the claims as would enable a charge of infringement to be made out.

Respectfully submitted,

HANS VOGT, JOSEPH MASSOLLE and
JOSEF ENGL.

By Ward Crosby and Smith
Their Attorneys

DS.AM

DIV. 7 Room 312 2-200 AKP-AH Paper No. 17.
Address only "The Commissioner of Patents, Washington, D. C." and not any official by name
All communications respecting this application should give the serial number, date of filing, title of invention and name of the applicant

DEPARTMENT OF ~~THE INTERIOR~~ COMMERCE

UNITED STATES PATENT OFFICE

WASHINGTON April 27, 1925.

Ward, Crosby & Smith
233 Broadway
New York City.

PATENT OFFICE, APR 27 1925 MAILED

Please find below a communication from the EXAMINER in charge of the application of
Hans Vogt et al; Serial No. 547,860; filed March 29, 1922;
for PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

Thomas E. Robertson
Commissioner of Patents.

6-2881 GPO

The amendment filed April 22, 1925 is of record.

Claim 1 is again rejected on Craig, 1,260,337, in view of Greensfelder, 1,254,684, both of record, and for reasons of record. Craig simultaneously takes a picture and a sound record and then developes them on the same film. Applicant's method varies only in that the records are reproduced on the same side of the film but this is what Greensfelder has done and as was pointed out in the last Office action. The rejection of this claim is final, ex parte Miller, 150 O.G. 837.

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7.

Examiner. Div. 7.

Appeal to Ex's Sec
#18

7

12000

REC'D MAY 22 1925 U.S. PAT. OFFICE

IN THE UNITED STATES PATENT OFFICE.

MAY 23 1925 U.S. PATENT OFFICE

In re application of
HANS VOGT, JOSEPH MASSOLLE,
and JOSEF ENGL,

Serial No. 547,860,

Filed March 29, 1922,

Process for Producing Combined
Sound and Picture Films.

Div. 7,

Room 312.

To the Commissioner of Patents,
Washington, D. C.

We hereby appeal to the Examiners-in-Chief from the decision of the Principal Examiner in the matter of our application for Letters Patent for an improvement in Process for Producing Combined Sound and Picture Films, Serial No. 547,860, filed March 29, 1922, which on April 27, 1925 was rejected the second time. The following are the points of the decision on which the appeal is taken;

1. The Examiner erred in not allowing claims 1, 3 and 4 of the above entitled application.

2. The Examiner erred in holding that claim 1 does not involve patentable invention over the references Craig and Greensfelder.

3. The Examiner erred in holding claims 3 and 4 have no basis in the disclosure made by applicants.

4. The Examiner erred in rejecting claims 1, 3 and 4 of the above entitled application.

Signed at New York City, in the County and State of New York, this 21st day of May, 1925.

HANS VOGT, JOSEPH MASSOLLE and
JOSEF ENGL.

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

Washington, D. C., JUN 2 - 1925

PATENT OFFICE JUN 2 1925 MAILED

Re. application of

Hans Vogt et al;

Serial No. 547,860;

Filed March 29, 1922;

For PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

BEFORE THE EXAMINERS-IN-CHIEF

ON APPEAL.

EXAMINER'S STATEMENT

This is an appeal from final rejection by the Examiner of claims 1, 3, and 4.

1. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so as expose the film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each.

incomplete

3. The method of producing talking moving pictures on the same film which comprises photographing simultaneously and upon separate films the picture and the sound, the photographing the sound record on an unexposed portion of the picture film.

4. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film between the marginal edge and the sprocket perforations thereof.

The art relied upon is:

CRAIG, 1,260,337, Mar. 26, 1918, (88-16.2);
GREENSFELDER, 1,254,684, Jan. 29, 1918, (88-16.2).

Considering claim 1:

Craig simultaneously takes separate sound and picture records. These negatives are then separately developed and

3/41

12000

$ 10 REC'D MAY 22 1925 U.S. PAT. OFFICE

IN THE UNITED STATES PATENT OFFICE.

MAY 23 1925 U.S. PATENT OFFICE

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DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

Washington, D. C., JUN 2 - 1925

PATENT OFFICE JUN 2 1925 MAILED

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3. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, the photographing the sound record on an unexposed portion of the picture film.

and

4. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film between the marginal edge and the sprocket perforations thereof.

The art relied upon is:

CRAIG, 1,260,337, Mar. 26, 1918, (88-16.2);
GREENSFELDER, 1,254,684, Jan. 29, 1918, (88-16.2).

Considering claim 1:

Craig simultaneously takes separate sound and picture records. These negatives are then separately developed and

reproduced upon a single positive film on opposite sides. Applicant prefers to reproduce the sound and picture records side by side on the same surface of the film and longitudinally of the strip. Greensfelder has already taught that the sound and picture film, Fig. 5 of Greensfelder, can be obtained in just this manner. On page 5, lines 108 to page 6, lines 4 of Greensfelder is outlined applicant's method of reproduction.

Claims 3 and 4 do not read on applicant's disclosure. In the specification, page 2, last paragraph, applicant outlines his method as a taking of records on separate films and a copying of the two negative films upon a single positive. This is not what he now attempts to claim as is clear from a reading of claims 3 and 4. These claims call for a separate taking as originally, but one of the negatives, the sound for example, is reproduced on an unexposed portion of the other negative, which is the picture strip. This is a different set of steps than that originally outlined.

For these reasons it is thought that the Examiner should be upheld in the rejection.

Respectfully,

Examiner, Division 7. 3/42

EXAMINERS-IN-CHIEF
SEP 17 1925
U. S. PATENT OFFICE

Appeal No. 12000 Paper No. 21

Brief.

UNITED STATES PATENT OFFICE

Washington, D. C.

Re, Application of
Hans Vogt et al;
Serial No. 547,860;
Filed March 29, 1922;
For PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

BEFORE THE
EXAMINERS-IN-CHIEF
ON APPEAL.

BRIEF FOR APPELLANT

The finally rejected claims 1, 3 and 4 may be divided into two groups; claim 1 is rejected on two references and claims 3 and 4 are rejected as not reading on applicants' disclosure. These claims 3 and 4 are copies from patent to DeForest 1489314, with which patent interference has been requested.

Considering first claim 1, it may first be noted that claim one as copied in the Examiner's statement June 2, 1925 is incomplete, the portion copied in the Examiner's statement being only the part substituted for the subject matter beginning line 1 and continuing through the words "appropriate for each" in line 7 of claim 1 as submitted by amendment filed September 27, 1924.

Claim 1 reads as follows:

> A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so as to expose the film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity, developing and treating the two negatives separately, to give the picture and sound negatives the length and character of development and treatment appropriate for each and printing from both negatives upon the same side of a single integral transparent sensitized film, the coating of which is all of the same character, to form the sound sequence at one side of, and parallel to, the picture sequence.

This claim calls for the following steps:

a. Photographing a sequence of pictures on one length of film.

b. Simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action.

b^1. So as to expose the film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity.

c. Developing and treating the two negatives separately to give the picture and sound negatives the length and character of development and treatment appropriate for each.

d. Printing from both negatives upon the same side of a single integral transparent sensitized film.

d^1. The coating of each is all of the same character.

d^2. To form the sound sequence at one side of and parallel to the picture sequence.

Applicants' invention relates to the production of a talking moving picture film in which the sound record, photographically produced, is on the same film with the picture record, also photographically produced. An underlying thought in the invention is that the sound and picture records require different development and treatment in order to obtain the best results. If the sound and picture records are photographed side by side upon the same strip of film, to form one negative, this strip must obviously all be developed at the same time so that the sound and picture negatives will be given the same length and character of development, after which the positive film is printed from this negative. This usual prior method was defective, as discovered by applicants herein, since the sound and picture records require different lengths of development and character of development to get the best results.

It should be understood that the photographic sound record is one in which the various tones and overtones, for

example, of a speaking or a singing voice, are represented on the film by slight variations in lines photographed on the film. This is accomplished as is well-known either by printing fine lines of slightly different lengths extending across the film or by printing lines of the same length but of varying densities, representing varying intensities of light. This latter is the form of record indicated for example in the patent of Craig referred to by the Examiner.

Whichever type of sound record is made, it is evident that very fine gradations of sound must be represented by slight differences in the photographic record thereof and that accordingly careful treatment in the development of the negative is required to bring out these gradations perfectly. If the same character of developer and same length of development are used for both the picture record and the sound record, it is now clear that either the pictures would not be uniformly developed the right way or else that the sound record would not be properly developed.

With the above understanding ofthe invention, the references cited by the Examiner may be briefly reviewed. Patent to Craig is entirely based on the idea of printing a picture record on one side of the film on one kind of emulsion coating and the corresponding sound record on the opposite side of the film on a different kind of emulsion coating. Naturally, such a combined record could not be reproduced if ordinary light passing through both the picture and the sound record was intercepted by both the sound and the picture records. Craig overcame this difficulty by having his picture record adapted to intercept rays of ordinary visible light only, while the sound record on the opposite side of the film would intercept rays of invisible, infra-red light only. That is to say, he made his photographic emulsion on one side of the film of one character, suitable for the ordinary picture record and the emulsion on the opposite side of the film

This claim calls for the following steps:

a. Photographing a sequence of pictures on one length of film.

b. Simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action.

b^1. So as to expose the film variously in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity.

c. Developing and treating the two negatives separately to give the picture and sound negatives the length and character of development and treatment appropriate for each.

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reproducing from his combined film he caused ordinary white light to pass through the film to reproduce the picture record and caused infra-red rays to pass through the film, to affect a selenium cell or the like to reproduce the sound record.

In order to get the sound and picture records on opposite sides of his finished positive film, the simplest and most convenient way was for him to make one negative of the sound record and another negative of the picture record, on separate film strips, so that the positive of the sound record could be printed from the one on one side of the positive film and the positive of the other could be printed in alignment therewith on the opposite side of the positive film strip.

Craig, however, had no thought of developing his two negatives in developing baths which would be different and with times of development which should be different because of the different treatments required for the sound record film and the picture film. The only object in making the two negatives on separate films was, apparently, convenience, in that he wanted to print on opposite sides of the positive film and it would be easier to do this when the sound and picture negatives were on separate film strips.

We therefore note that Craig does not have the limitation of applicants' claim 1 noted above in paragraph c[1] of developing and treating the two negatives separately to give the picture and sound negatives the length and character of development and treatment appropriate for each. Neither does he meet limitation d of printing from both negatives upon the same side of a film, nor does he print upon a film the coating of which is all of the same character, which is limitation d[1] noted above, nor does he form the

sound sequence at one side of and parallel to the picture sequence, as called for in limitation d^2.

The Examiner seems to have ignored most of the above distinctions and it is thought that the resemblances between Craig and the invention of the present application are merely superficial, applicants' invention being something quite different from that of Craig.

The Examiner attempts to combine the Craig patent with Greensfelder in order to reject this claim. Greensfelder does not make a talking moving picture at all. He makes a series of moving pictures, without simultaneously recording the voices of the actors and without simultaneously recording any sounds accompanying the action. All that he does is to record instrumental music which he thinks might suitably accompany the moving pictures. This music is not recorded simultaneously with the pictures, but is recorded by an operator who plays a piano or beats a drum, etc., at what he considers the proper times, when the moving picture record is subsequently reproduced. He has an elaborate mechanical arrangement whereby the instrument which the player operates is connected and controlled by certain mechanisms so that what he terms "Sound Marks" are produced on a film. The strip containing these sound marks is something like the perforated strip of a mechanical piano player, containing transparent lines, all of equal transparency, but of varying lengths as is shown in Fig. 5 of this patent. It is stated on page 4 of the patent beginning line 9 that a perforated roll of the music such as is used in player pianos may be made and photographed to produce his sound marks.

In reproducing the sound and pictures in his system, the light passes through the transparent portions of his sound record and serves to operate selenium cells, each of

which operates a different musical mechanism such as a separate piano key.

In his reproducing apparatus each sound mark on his film serves as an entirety to put a separate selenium cell into action to operate a different musical mechanism such as a separate piano key. The length of a sound mark varies in proportion to the duration of the sound. He does not at all consider any gradual differences of the opacity of the film. There are no gradations of light and darkness in his sound record since the latter is composed entirely of translucent and dark portions, the translucent portions all being of identically the same amount of transparency. He has nothing corresponding to applicants' sound record which as noted in limitation b^1 of the claim is made in correspondence with vocal or other sounds having slight or otherwise varying differences of tone and intensity.

In applicants' case the photographic sound record on the film must correspond in minute detail to the various frequencies and intensities of sound having the various overtones and shadings of the human voice. As has been explained, the negative of such a record must be developed carefully to bring out the slight gradations of tone. In Greensfelder on the other hand there is no need of developing the sound marks and pictures in any different way from each other because of the fact that his sound marks are composed of entirely translucent rectangles having no gradations which must be properly brought out in development. Greensfelder had no thought and had no need of giving his sound marks a different sort of development from that given to the picture negative.

Considering the limitations in applicants' claim 1, Greensfelder does not <u>simultaneously</u> photograph the sounds on a separate strip as called for in limitation b and he does

not record the sort of sounds called for by limitation b^1 and he does not give the separate development called for by limitations c, c^1. All that he does is to print his sound marks at one side of a/nd parallel to the picture record.

It is thought that these two references cannot possibly be combined but that if they are combined they still fail entirely to meet the invention covered by the claim. They do not jointly produce a combined talking moving picture film in which the components have been properly and separately developed, and which can be reproduced by ordinary light to give a reproduction of the vocal or other finely graduated sounds accompanying the actions shown in the pictures as is required in a practical talking moving picture system. Craig could not print his two records on the same side of a single integral film having an emulsion coating of the same character since his system apparently requires the pictures and sound record to be formed on emulsion coatings of different character.

Discussion of Claims 3 and 4

Referring now to the claims copied from the DeForest patent 1489314. No question of patentability or invention can be considered in connection with these claims since the same are copied from an issued patent. The only question is whether applicants' have a right to claim the invention in the language of these two claims. The present application has a priority date earlier than the filing date of the DeForest patent.

It is thought that the said two claims, as appearing in the DeForest patent, must be construed to make them mean something operative. If the claims are construed in the absolutely literal way called for by the Examiner, there is question whether the same cover an operative structure.

If as is thought the DeForest patent is somewhat ambiguous and the claims may properly be given such an interpretation as to make an operative structure which applicants' also can claim, then in that case applicants' should be allowed to copy the claims and have the questions involved decided inter-partes.

The Examiner states in his Examiner's statement of June 2, 1925, that these claims call for the simultaneous making of separate negatives of the pictures and the sounds and then the photographing of the sound record on an unexposed portion of the picture negative. That is to say, the sound negative is printed on an unexposed portion of the picture negative, which produces a sound positive on the unexposed portion of the picture negative.

film

It is obvious that a picture negative would not be used for projection purposes and the claim is therefore incomplete. If a further step be added, a print is then made from this record which would produce a picture positive and a sound negative both on the same film strip. It does not seem likely that this is the meaning of the patentee and there is nothing in the patent to indicate that this is meant.

In the Examiner's action of April 6, 1925, a suggestion is made, that a positive of the sound record might be made from the negative sound record and a reprint of this made on the original picture negative so as to get a sound negative on the same strip with the picture negative after which a positive could be made from both the sound and picture negatives. The Examiner has apparently dropped this suggestion so it need not now be discussed at length. In accordance with this theory, however, four strips of film would be required and there is nothing in the specification to indicate that the patentee meant to print a positive of his

sound record as a separate step and then reprint from this on to the picture negative. This suggestion is not at all justified in DeForest's disclosure.

Another interpretation of the claims, in accordance with which applicants' can make the claims, is that the two negatives are made on separate strips after which a positive is made from the picture negative and this is considered as the picture film. Considering applicants' claim 3 which is claim 1 of the deForest patent, all that is omitted from the claim, in this view, is the step of printing a positive from the picture negative. With this step understood, the picture positive, on which the sound negative or implied is subsequently printed, is the third strip of applicants' process, on which both the sound and picture negatives are printed.

It is reasonable to assume that this is the meaning of the claim because of the language of DeForest, page 6, lines 106-108 and page 2, lines 1 and 2. It is there stated that the sound record is printed on the motion picture film 10, which latter is either exposed as to the picture spacing 11 thereof and unexposed as to the marginal edge thereof or unexposed as to its entire surface.

When DeForest states that his motion picture film may be unexposed as to its entire surface at the moment when the sound record is printed thereon, an inference may be that the "motion picture film" is intended to mean the film which is adapted to carry the motion pictures and that either the sound record or the picture record may first be printed thereon and the other record printed thereafter.

"The motion picture film 10" referred to in the patent, page 1 line 106, seems to mean the same thing as "the picture film" in last line of the claim. It is not

seen how this can mean the negative picture film as called for by the Examiner if it is possible that this film is unexposed as to its entire surface at the time that the sound record is imprinted on the edge thereof. The sound and picture negatives have been made simultaneously and therefore the picture negative has been exposed as to the picture spacing thereof. With this construction of the claims applicants' clearly have a right to make the same.

Also note that nowhere in his specification does deForest suggest that the "motion picture film," on the edge of which he prints his sound record, is a negative picture film. See page 1,lines 45, 53-54, 68, 80,106,page 2 lines 6,16,and 25. Reference to the "standard motion picture film" would seem rather to indicate the positive film, intended for projection.

It is urged that any doubt as to the meaning of these claims should be resolved by permitting applicants' to make the same so that the interference may be declared. deForest is, of course, not bound by the interpretation which the Examiner has placed upon these claims and, if no interference is declared, he may subsequently urge such an interpretation of them as would cause them apparently to dominate applicants' invention. In such a case applicants' patent,if issued with other claims, of different scope, could not even be urged as prior invention against DeForest under the decision Davis-Bournonville vs. Milburn 297 F.854. Also since applicants' application was co-pending with DeForest a patent issued on applicants' application could not be considered as prior art against DeForest.

Therefore, if there is any possibility of the DeForest claims being interpreted to read on applicants' structure, as has been suggested above, the interference should be declared and applicants given the privilege of contesting the question of priority with DeForest. Then if DeForest should wish to contend that his claims have such a meaning that applicants have no right to copy the same, he would have the right to bring a motion to dissolve in which case the question would be decided inter-partes and a [illegible]

binding effect upon him in any subsequent litigation, whereas the decision of the Examiner in the ex-parte consideration of the present application has no binding effect upon DeForest.

In case DeForest should hold the view that his claims mean something different from that of applicants' invention, in accordance with the view of the Examiner, little if any hardship would be imposed upon him to bring a motion to dissolve an interference as suggested. On the other hand, if applicants are not given the right to enter the interference, an irreparable injury may be caused to them for reasons stated above.

It seems that the deForest claims are susceptible to such an interpretation as to permit applicants to copy the same as has been shown above in connection with the citation from the DeForest patent, page 1, lines 106 and following.

For all of the above reasons it is prayed that the decision of the Examiner be overruled and that the claims be allowed.

Respectfully submitted,

Hans Vogt, et al.

By Ward Crosby and Smith

Their attorneys.

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binding effect upon him in any subsequent litigation, whereas the decision of the Examiner in the ex-parte consideration of the present application has no binding effect upon DeForest.

In case DeForest should hold the view that his claims mean something different from that of applicants' invention, in accordance with the view of the Examiner, little if any hardship would be imposed upon him to bring a motion to dissolve an interference as suggested. On the other hand, if applicants are not given the right to enter the interference, an irreparable injury may be caused to them for reasons stated above.

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For all of the above reasons it is prayed that the decision of the Examiner be overruled and that the claims be allowed.

Respectfully submitted,

Hans Vogt, et al.

By Ward Crosby and Smith

Their attorneys.

Appeal No 12000 Paper No. 22

Decision

U. S. PATENT OFFICE
EXAMINERS IN CHIEF

EGB.

OCT 14 1925

COPY MAILED

Hearing:
Sept. 17, 1925.

Appeal No. 12,000. U. S. Patent Office. Oct. 14,1925.

Before the Examiners-in-Chief, on appeal.

Application of Hans Vogt, Joseph Massolle and Josef Engl for a patent for an improvement in Process for Producing Combined Sound and Picture Films, filed Mar. 29, 1922, Serial No. 547,860.

Messrs. Ward, Crosby & Smith, attorneys for appellants.

This is an appeal from the decision of the examiner finally rejecting claims 1, 3 and 4, on the references and for the reasons of record. These claims, the invention defined thereby, the references and the disclosures therein pertinent to the claims are sufficiently set forth in the examiner's statement and need not be repeated here.

Pertinency of References and Opinion.

Considering first claims 3 and 4 which are copied from the patent to Lee de Forest, No. 1,489,314, Apr. 8, 1924, being claims 1 and 3 thereof, the examiner in his statement sets forth that in the last of page 2 of the specification appellants outline their method of photographing records on separate films and the photographing or

copying of the two negatives resulting upon a single film, the making of a positive therefrom or in the language of said paragraph "copying the two negatives consecutively upon the same positive films".

Claim 1 is more specific but fully covers and includes all that is set forth in said paragraph and is not inconsistent therewith. The examiner further states, page 2, that the above method as described

> "is not what he now attempts to claim as is clear from a reading of claims 3 and 4. These claims call for a separate taking as originally, but one of the negatives, the sound for example, is reproduced on an unexposed portion of the other negative, which is the picture strip. This is a different set of steps than that originally outlined."

This statement is believed to be in error since if we read the de Forest specification and claims correctly, de Forest in addition to photographing the picture and sound simultaneously upon separate films "photographs the sound record"(not the negative)" on an unexposed portion of the picture film"(Claim 1) or "upon an unexposed portion of the picture film" located as "between the marginal edge and the sprocket perforations thereof" (Claim 3).

Figure 3 of said patent is described as follows:

> "Fig. 3 is a diagrammatic view illustrating the principle involved in recording the sound waves photographically, in accordance with my invention, on the marginal edge of a <u>standard</u> motion picture film."

Inasmuch as the record so produced is a "standard motion picture film' we consider it is necessarily a positive, such as used in projection and reproduction of sound and not a negative as the examiner states.

The de Forest specification may be somewhat vague but in our opinion the language is sufficient as a whole to convey the idea above stated and to interpret the language as directed to the photographing by a negative upon the picture negative or upon a film which had a negative thereon(photographed or exposed),or upon which a picture negative was to be formed would be senseless. We are therefore unable to discover any good reasons why appellants cannot make these claims and are of the opinion that appellants' method as originally described fully supports this right to make them on the disclosure in their application and we so hold.

The Craig patent was cited in the prosecution of de Forest's claims 4 and 6 (now 1 and 3 which upon argument by counsel were allowed notwithstanding that the disclosure of Craig shows the production of two separate negatives, page 7, lines 92-95, and the production of a plurality of records side by side, Fig. 8, and page 7, lines 57-67. De Forest's contention was that these claims overcome the Craig patent since it was a physical impossibility for the Craig arrangement to permit the accomplishment of appellants' invention." The examiner allowed these claims which is evidence of their patentability notwithstanding that the Greenfield patent was prior art and

which shows the printing of the two positives side by side, Fig. 5, as does also the Craig patent as above set forth. Greenfelder does not photograph his negatives simultaneously. While the disclosures in these patents may tend toward a possibility of doubt as to invention being involved in the process defined by claim 1 the grant of the patent to de Forest and the lack of clear anticipation in either of the references or in their combination as to the addition or substitution of features in one not shown in the other and involving the question of invention vs. mechanical skill, we are of the opinion that claim 1 should be allowed in the absence of more pertinent and anticipatory art and appellants allowed to be placed in interference with de Forest to determine the question of priority. That this opinion is correct is believed to be confirmed by the decision of the Commissioner of Patents in **Both vs. Barr**, 200 O.G. 29:

> "Where an applicant seeks an interference with a patent, held that the claims in the application should not be rejected unless such rejection is based upon a clear anticipation,"

and Ex parte Brinkman cited therein quoting portions of Commissioner Ewing's decision wherein he held:

> "The question has been raised elsewhere as to the propriety of the refusal by this Office to grant a claim to an applicant which is the same as the claim of a patent disclosing interfering subject-matter. Without passing on this broad question, it seems to me clear that after a patent has once been granted it is not good practice to reject an applicant seeking an interference, where the rejection is based upon no clear anticipation, but the

3/57

piecing together of several patents.

* * * * * *

I therefore direct the Examiner to withdraw his rejection of claim 21 and to declare an interference with the Lewis patent."

(Page 30, 1914 C.D. p.30).

This is pertinent to the allowance of claim 1 here.

Decision.

The decision of the examiner is reversed both as to the rejection of claim 1 and appellants' right to make claims 3 and 4.

Sidney F. Smith.

Frank E. Timm.

W. S. Ruckman.

Examiners-in-Chief. 3/58

Letter to Office

23

OCT 16 1925 U.S. PATENT OFFICE

U.S. Patent Office
OCT 17 1925
DIVISION VII

IN THE UNITED STATES PATENT OFFICE

In re application of Hans Vogt, Joseph Massolle, and Josef Engl,	
Serial No. 547,860,	Div. 7,
Filed March 29, 1922,	Room 312.
Process for Producing Combined Sound and Picture Films.	

New York, N.Y.,

October 15, 1925.

Hon. Commissioner of Patents,
Washington, D. C.

S i r :

We presume that the Examiner has now noted the decision of the Board of Examiners-in-Chief of Oct. 14, 1925 allowing claim 1 and affirming the right of appellants, the applicants herein, to make claims 3 and 4.

The said claims 3 and 4 are claims 1 and 3 of patent to Lee DeForest, 1,489,314, dated April 8, 1924, Recording Sound.

The Examiner was requested by amendment filed April 1, 1925 to declare an interference with the said patent on the subject matter of said claims and this request is now repeated in view of the said decision of the Examiners-in-Chief.

Respectfully submitted,

HANS VOGT, JOSEPH MASSOLLE and
JOSEF ENGL

By Ward Cady and Smith
Their Attorneys

INTERFERENCE.

Interference No. 53103 *Paper No.* 24

Name. Hans Vogt. et al.,

Serial No. 547,860.

Title, PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

Filed, March 29, 1922.

Interference with Lee deForest, Patent No. 1,489, 314.

DECISIONS OF

Law Examiner, ——— *Dated,* ———

Ex'r of Interferences, Favorable *Dated,* July 14/28

Board, Affirmed *Dated,* Jan 7-1930

~~*Commissioner*~~ Court, Affirmed *Dated,* May 25/31

REMARKS:

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

Forwarded from ....7..... Div. to Examiner of Interferences

2 / 13

Paper No. 25
INTERFERENCE

November 2, 1925.

DEPARTMENT OF ~~XXXXXXXXXX~~ COMMERCE

UNITED STATES PATENT OFFICE

WASHINGTON, D. C.

(Copy mailed ~~each applicant and~~ assignee.)

PATENT OFFICE
NOV 10 1925
MAILED

Ward, Crosby & Smith

235 Broadway

New York City.

Please find below a copy of a communication from the Examiner concerning the

application of Hans Vogt et al; Serial No. 547,860; filed March 29, 1922; for PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.

Very respectfully,

Room No. 106

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON D. C.

Thomas E. Robertson.

Commissioner of Patents.

53103

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by rule 110 must be sealed up and filed on or before .....JAN4 1926..... *, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is*

1. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film.

2. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film between the marginal edge and the sprocket perforations thereof.

This interference involves your application, above identified, and

A patent for Recording Sound, granted to Lee deForest, of 1415 Sedgewick Ave., New York City, on Serial No. 485,332, filed July 16, 1921, patent No. 1,489,314, dated April 8, 1924, whose attorneys are Darby & Darby, St. Paul Bldg., New York City, and whose assignee is

the DeForest Phonofilm Corporation, of Jersey City, N. J., a corp. of New Jersey.

The relation of the counts of the interference to the claims of the respective parties is as follows:

Counts	Vogt. et al.	DeForest
1	3	1
2	4	3

No other claims will be held subject to the decision in the interference.

Counts Compared.

Examiner, Div. 7.

Div. 7 Room 104 WCP/IR Paper No. 29

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

All communications respecting this application should give the serial number, date of filing, and name of the applicant

Please find below a communication from the EXAMINER in charge of this application

July 8, 1931

Thomas E. Robertson
Commissioner of Patents

Applicant H. Vogt et al

Ser. No. 547,860
Filed Mar. 29, 1922
For Process For Producing Combined Sound And Picture Films

Ward & Crosby & Neil
233 Broadway
New York, N.y.

MAILED
JUL 7 '31

In accordance with the provisions of Order No. 2308, dated March 12, 1917, which reads in part as follows:

> Obvious informalities in the application may be corrected by the Examiner, but said correction must be in the form of an amendment, approved by the Principal Examiner in writing, placed in the file, and made a part of the record. The changes specified in the amendment will be entered by the clerk in the regular way.

the changes, hereinafter specified, are made by the examiner in the application above identified.

Should these changes not be satisfactory to the applicant, appropriate amendment may be proposed under the provisions of Rule 78, provided the specification has not been printed.

The application has been amended as follows.

In Claim 1, to has been inserted at the end of line 6.

Examiner.

amendment 2

4-30

APPLICATION DIV. U.S. PATENT OFFICE JUL 15 31

IN THE UNITED STATES PATENT OFFICE

In re application of	)	
HANS VOGT, et al	)	
Filed Mar. 29, 1922	)	
Serial No. 547,860	)	Div. 7, Room 104.
For: PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS.	)	

U.S. PATENT OFFICE JUL 15 1931 DIVISION VII

July 15, 1931.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:

Please amend the specification as follows:

Page 1, prior to line 1 insert --This invention relates to processes for producing combined sound and motion picture films.--

Page 1, line 4, after "same" insert--piece of--; Same line cancel "separate";

Line 7, cancel "light" and substitute--exposure of--.

Line 8, cancel as far as comma (,) and substitute --the silver bromide coating--.

Line 9, change "overlighted" to --overexposed-- and "underlighted" to --underexposed--.

Line 10, cancel "bears" and substitute--carries--.

Line 11, cancel "continuously" and change "lighted" to --exposed--.

Line 12, after "these" insert--difficulties resulting from--;; after "differences" insert--in exposure--;

same line, cancel "removed" and substitute--remedied--.

Line 13, after "negatives" insert a comma (,) and after "developing" insert--practices such as by--.

Line 14, cancel "removed" and substitute--remedied--.

Line 15, cancel "lighted" and substitute --exposed--; cancel "overlighted" and substitute--overexposed portions of the --; same line, cancel "places".

Line 16, cancel "corresponding" and substitute --appropriate--, and change "treatment" to --treatments--.

Line 18, after "sequences" insert -- --picture and sound-- --.

At the end of line 19, insert --strip--.

Line 22, cancel "production" and substitute --simultaneous photographing--; same line before "negatives" insert--sound and picture--; after "negatives" insert a comma (,).

Line 24, change the period (.) to a comma (,) and add:

--when separately developing the negatives if and in the manner required to remedy the difficulties, and then printing both sequences--picture and sound-- on the different portions of the same positive film.--

Line 26, after "and" insert --or--.

Line 27, before "positive" insert--combined--.

Line 28, before "preferably" insert -- -- sound and picture-- --.

In the specification, page 2, amend the first paragraph to read as follows:

One can, however, previous to the printing, unite longitudinally together the two developed negative films, and then copy this so united negative in the usual manner.

Page 2, cancel "We claim" and substitute the following:

Other benefits may also be derived from the broader aspects of the invention, i.e., from employing separate or separable film areas for the recording of the sound and picture negatives, and then printing both the sound and picture sequences on different portions of the same positive film.

In the following claims where reference is made to a "length of film" upon which a sound record is recorded, such "length of film" shall be interpreted as referring to a strip of film which may be either entirely separate from or merely separable from the film strip carrying the picture sequence.

While the invention has been described in detail with respect to certain particular preferred examples thereof which give satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

Kindly amend Claim 1 by inserting in line 7 before "film", --last mentioned length of --.

Claim 2, line 5 after "and" insert--on--.

Kindly add the following new claims.

5. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the two negatives in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to form the sound sequence at one side of and along the picture sequence.

6. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to fo the sound sequence at one side of and along the picture sequence.

7. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon the same face of the same sensitized film at different longitudinally extending portions thereof, to form the sound sequence at one side of and along the picture sequence.

8. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing said negative picture record upon a portion of a sensitized film not exposed to a sound record, and photographing the negative sound record on the same face of said last film and at a portion thereof not exposed to the picture record.

9. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing said negative picture record upon a portion of a sensitized film not exposed to a sound record, and photographing the negative sound record on the same face of said last film and at a portion thereof not exposed to the picture record, said last two photographing steps being performed consecutively.

10. A process for producing a combined sound and picture positive film, for sound motion pictures, comprising, photographing a sequence of pictures on one length of film, and photographing on another length of film a corresponding sequence of sound vibrations to accompany the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

11. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

R E M A R K S

The several amendments have been made in the specification to clarify the original foreign translated specification, these amendments insofar as they could be made consistent with the original specification, follow the language of the official translation of the original German text which is of record in the interference proceedings. With the exception of the introductory and closing clauses of the specification, all of these amendments have also been approved by the Examiner at an interview courteously granted to Applicants' attorneys. The introductory clause is obviously justified by the original disclosure and title of the application and the subject matter of the new closing paragraphs is in part merely formal and in other respects fully justified by the original disclosure and the claims now allowed.

It is submitted that all of the new claims are clearly allowable in view of the allowance of Claim 1 by the Board of Appeals and in view of the allowance of Claim 3 in the DeForest application. It is noted further that the decision of the Board of Appeals in holding that these applicants are entitled to make Claim 3 justifies the allowance of the new claims which include not only the outstanding features of the combination of process steps of Claim 3, but contain more specific subject matter as well.

It is noted that Claim 6 includes the steps of photographing the picture sequences and accompanying sound sequences on different lengths of film. Each of these lengths of film may be separately developed in a manner ap-

propriate for each, both of these records thereafter being printed on a common film along side of each other. It is submitted that none of the citations shows this advantageous series of process steps which permit the sound and picture records respectively to be independently treated in the appropriate manner, and then both printed side by side on a single film which is convenient to handle and use and insures the proper synchronism in reproduction at all times regardless of the fact that the sound and picture records may be given quite independent developing treatments.

It is noted that the Greensfelder citation of record distinguishes from Claim 6 in that that patent does not refer to talking motion pictures and it does not teach the step of photographing on a length of film a sequence of sounds accompanying the action since the portions of the Greensfelder films which control the production of sounds or noises are not sound records but merely light admitting apertures which are used to control original sound producing instrumentalities during the display of the pictures. Furthermore, with Greensfelder the problems of separately developing the two original lengths of film do not arise. Accordingly it is submitted that this claim is directed to a process essentially different from anything suggested in that patent. Claim 6 is distinguished from the Craig citation of record in that Craig does not form a sound sequence at one side of and along the picture sequence on the positive film; further distinctions between Claim 6 and the Craig and other patents of record are believed to be ap-

parent from the repeated discussions of the prior art previously made in the record. In any event the decision of the Board of Appeals on Claims 1 and 3 fully justifies the allowance of Claim 6.

Claim 5 which is very similar to Claim 6 but slightly more specific in lines 6 and 7 is obviously allowable for the same reasons as above pointed out in connection with Claim 6. It is submitted that the similar Claim 7 is also clearly allowable, especially in view of thefact that the latter part of Claim 7 is more specific than Claim 6.

It is submitted that Claims 10 and 11 are also both allowable for the same reasons as above pointed out in connection with Claim 6.

The allowance of Claims 8 and 9 is clearly justified in view of the fact that these claims follow very closely the subject matter of Claim 3 which was copied from the DeForest patent. In the latter part of Claims 8 and 9 the applicants have endeavored to more specifically and definitely (in the light of applicants' disclosure) set forth the last process step of Claim 3.

The Examiner will recall that each of these new claims has been briefly reviewed with applicants' attorneys at an oral interview at which most of the above facts were brought out and it is understood that the Examiner is of the opinion that with this amendment the application is ready for immediate allowance, which action is respectfully requested.

Respectfully submitted

HANS VOGT, et al.

By Ward Brady & Mead

His Attorneys.

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

Div. 7
IR

Serial No. 547,860

MAILED
JUL 16 1931

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

July sixteen, 1931

Hans Vogt, et al, Assors.,

Your APPLICATION for a patent for an IMPROVEMENT in PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS,

filed Mar. 29, 1922 has been examined and ALLOWED with 11 claims.

The final fee, TWENTY-FIVE DOLLARS, WITH $1 ADDITIONAL FOR EACH CLAIM ALLOWED IN EXCESS OF 20, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent will be withheld, but the application may be renewed within one year after the date of the original notice with a renewal fee of $25 and $1 additional for each claim in excess of 20.

The office delivers patents upon the day of their date, on which date their term begins to run. The preparation of the patent for final signing and sealing will require about four weeks, and such work will not be begun until after payment of the necessary final fee.

When the final fee is paid, there should also be sent, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF THE INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If it is desired to have the patent issue to an ASSIGNEE OR ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of the final fee.

After issue of the patent, uncertified copies of the drawings and specifications may be purchased at the price of TEN CENTS EACH. The money should accompany the order. Postage stamps will not be received.

The final fee will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

NOTICE.—WHEN THE NUMBER OF CLAIMS ALLOWED IS IN EXCESS OF 20, NO SUM LESS THAN $25 PLUS $1 ADDITIONAL FOR EACH CLAIM IN EXCESS OF TWENTY CAN BE ACCEPTED AS THE FINAL FEE.

Respectfully,

Thomas E. Robertson
Commissioner of Patents.

Ward, Crosby & Neil
233 Broadway
New York, N.Y.

3/73

IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

SEP-331 313201 H-Cash 25.00

MAIL DIVISION SEP-3 31 U.S. PATENT OFF.

829

U. S. Patent Office

FINAL FEE PAID TO THE COMMISSIONER OF PATENTS

(Be careful to give correct Serial No.)

Serial No. 547,860

INVENTOR:

Hans Vogt et al

PATENT TO BE ISSUED TO

as per record

NAME OF INVENTION, AS ALLOWED:

~~PROCESS FOR PRODUCING COMBINED SOUND AND PICTURE FILMS~~

DATE OF PAYMENT:

September 3, 1931

FEE:

$20, ~~25.00~~

DATE OF FILING:

March 29, 1922

DATE OF CIRCULAR OF ALLOWANCE:

July 16, 1931

The Commissioner of Patents will please apply the accompanying fee as indicated above.

Ward, Crosby & Neal
Attorneys

SEND PATENT TO

Ward, Crosby & Neal

225 Broadway

New York, N. Y.

Final fees will not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

11—4878

31/34

MAIL DIVISION
SEP - 3 31
U.S. PATENT OFFICE

7463
ISSUE DIVISION
SEP 4 19 M.
U. S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,

Ser. No. 547,860,

Filed Mar. 29, 1922,

For Process for Producing Combined Sound and Picture Films.

Div. 7, Room 104.

German Reich
Province of Brandenburg
Consulate General of the
United States of America
at Berlin
} ss.

SUPPLEMENTAL OATH

Consulate General of the United States)
) ss:
City of Berlin, Republic of Germany)

JOSEF ENGL, one of the joint applicants of the above entitled application, being duly sworn, deposes and says that he has read the amended specification and claims of the above entitled application as allowed on July 16, 1931, and as attached hereto, and understands the contents of the same; that the subject matter of said claims, including the process therein defined and the resulting product, was invented by himself jointly with Joseph Massolle and Hans Vogt before the filing of the above entitled application and before the filing of the corresponding German application as recited in the oath filed with the above entitled application; was not known or used before the invention of the same by applicants; was not patented or described in a printed publication in any country more than two years before the filing of the above entitled application; was not patented in any foreign country on an application filed by applicants or

their legal representatives or assigns more than twelve months before the above entitled application; was not in public use or on sale in the United States for more than two years before the above entitled application; and that said subject matter of invention has not been abandoned.

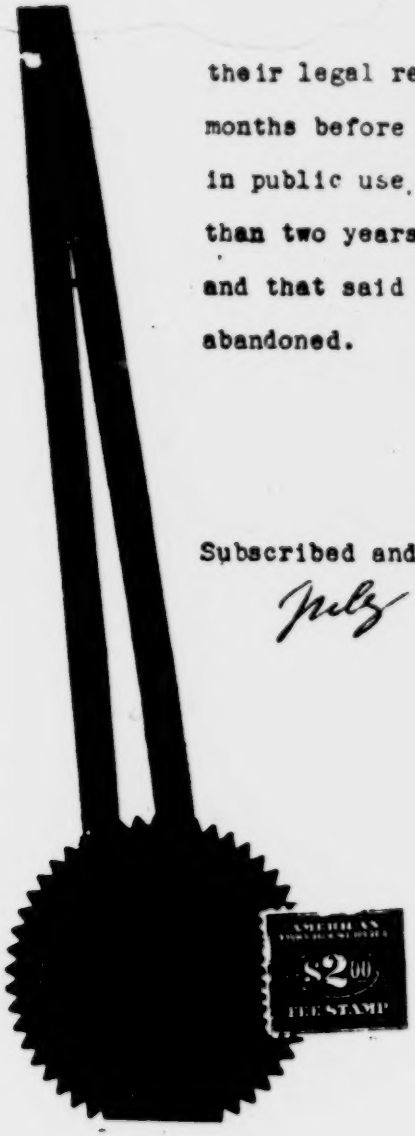
Josef Ensel

Subscribed and sworn to before me this 25th day of July, 1931.

Alfred W Jones

~~United States Consul~~

ALFRED W JONES
Vice Consul at the United States of America



SERVICE No 5703

$2 = 8.44

Paper 33
U. S. PATENT OFFICE
ISSUE DIVISION
SEP 4 1931
U. S. PATENT OFFICE

SEP-3 31

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,

Ser. No. 547,860,

Filed Mar. 29, 1922,

For Process for Producing Combined Sound and Picture Films.

Div. 7, Room 104.

German Reich
Province of Brandenburg
Consulate General of the United States of America at Berlin
} ss.

SUPPLEMENTAL OATH

Consulate General of the United States
City of Berlin, Republic of Germany
} ss:

HANS VOGT, one of the joint applicants of the above entitled application, being duly sworn, deposes and says that he has read the amended specification and claims of the above entitled application as allowed on July 16, 1931, and as attached hereto, and understands the contents of the same; that the subject matter of said claims, including the process therein defined and the resulting product, was invented by himself jointly with Joseph Massolle and Josef Engl before the filing of the above entitled application and before the filing of the corresponding German application as recited in the oath filed with the above entitled application; was not known or used before the invention of the same by applicants; was not patented or described in a printed publication in any country more than two years before the filing of the

their legal representatives or assigns more than twelve months before the above entitled application; was not in public use or on sale in the United States for more than two years before the above entitled application; and that said subject matter of invention has not been abandoned.

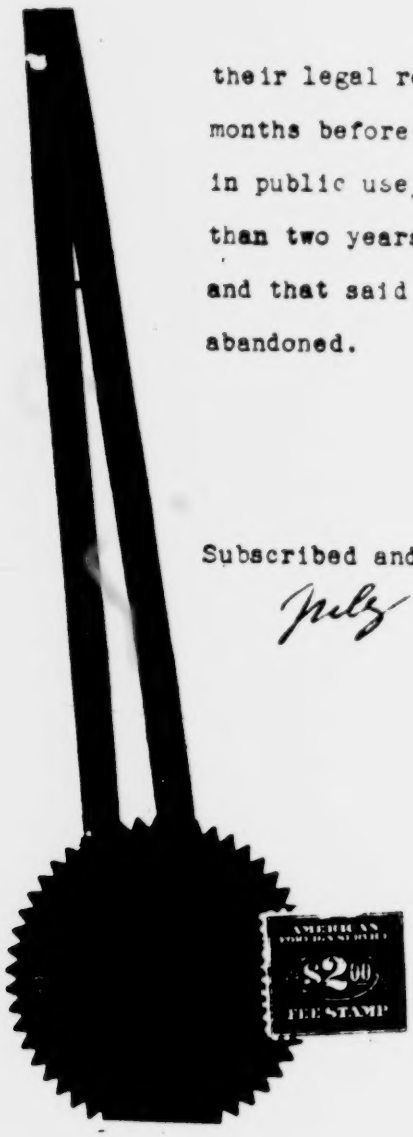
Josef Ernst

Subscribed and sworn to before me this 25th day of July, 1931.

Alfred W Jones

~~United States Consul~~

ALFRED W JONES
Vice Consul of the United States of America



SERVICE NO 5703

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ISSUE DIVISION
SEP 4 1931
U. S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,
Ser. No. 547,860,
Filed Mar. 29, 1922,
For Process for Producing Combined Sound and Picture Films.
Div. 7, Room 104.

German Reich
Province of Brandenburg
Consulate General of the United States of America at Berlin } ss

SUPPLEMENTAL OATH

Consulate General of the United States }
City of Berlin, Republic of Germany } ss:

HANS VOGT, one of the joint applicants of the above entitled application, being duly sworn, deposes and says that he has read the amended specification and claims of the above entitled application as allowed on July 16, 1931, and as attached hereto, and understands the contents of the same; that the subject matter of said claims, including the process therein defined and the resulting product, was invented by himself jointly with Joseph Massolle and Josef Engl before the filing of the above entitled application and before the filing of the corresponding German application as recited in the oath filed with the above entitled application; was not known or used before the invention of the same by applicants; was not patented or described in a printed publication in any country more than two years before the filing of the above entitled application; was not patented in any foreign country on an application filed by applicants or their

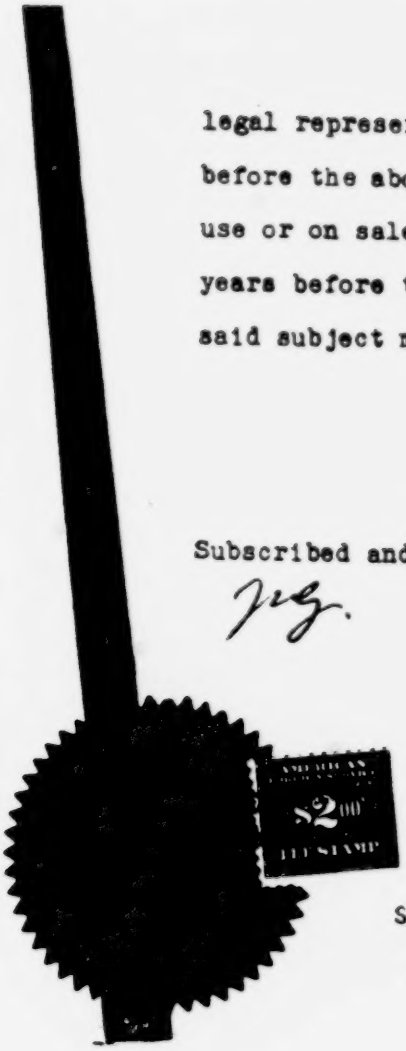
legal representatives or assigns more than twelve months before the above entitled application; was not in public use or on sale in the United States for more than two years before the above entitled application; and that said subject matter of invention has not been abandoned.

Hans Luft

Subscribed and sworn to before me this 29th. day of July, 1931.

A. W. Jones

~~United States Consul~~
ALFRED W. JONES
Vice Consul of the United States of America.



SERVICE No. 5780

12 - 44844

Paper 34

ISSUE DIVISION

SEP 4

U. S. PATENT OFFICE

SEP - 3 31

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,
Ser. No. 547,860,
Filed Mar. 29, 1922,
For Process for Producing Combined Sound and Picture Films.
Div. 7, Room 104.

SUPPLEMENTAL OATH

German Reich
Province of Brandenburg
Consulate General of the United States of America at Berlin

Consulate General of the United States)
) ss:
City of Berlin, Republic of Germany)

JOSEPH MASSOLLE, one of the joint applicants of the above entitled application, being duly sworn, deposes and says that he has read the amended specification and claims of the above entitled application as allowed on July 16, 1931, and as attached hereto, and understands the contents of the same; that the subject matter of said claims, including the process therein defined and the resulting product, was invented by himself jointly with Josef Engl and Hans Vogt before the filing of the above entitled application and before the filing of the corresponding German application as recited in the oath filed with the above entitled application; was not known or used before the invention of the same by applicants; was not patented or described in a printed publication in any country more than two years before the filing of the above entitled application; was not patented in any foreign

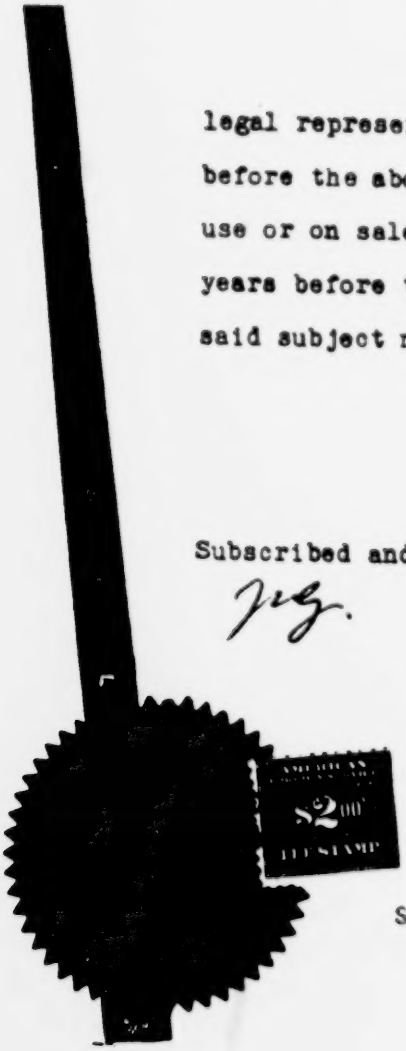
legal representatives or assigns more than twelve months before the above entitled application; was not in public use or on sale in the United States for more than two years before the above entitled application; and that said subject matter of invention has not been abandoned.

Hans Luft

Subscribed and sworn to before me this 29th. day of July, 1931.

Alfred W. Jones

~~United States Consul~~
ALFRED W JONES
Vice Consul of the United States of America



SERVICE No. 5780

P 2 - 44844

ISSUE DIVISION
SEP 4
U. S. PATENT OFFICE

SEP - 3 31

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,
Ser. No. 547,860,
Filed Mar. 29, 1922,
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SUPPLEMENTAL OATH

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legal representatives or assigns more than twelve months before the above entitled application; was not in public use or on sale in the United States for more than two years before the above entitled application; and that said subject matter of invention has not been abandoned.

Joseph Cassalle

Subscribed and sworn to before me this 19th day of August, 1931.

Cyrus B. Follmer
CYRUS B. FOLLMER
United States Consul
vice

SERVICE No. 6260

$ 2.-- = P. 44 Rmks

DIVISION
SEP 9 1931
U. S. PATENT OFFICE

SEP 3 31
MAIL DIVISION
SEP 3 31
U.S. PATENT OFFICE

This invention relates to processes for producing combined sound and motion picture films.

In the production of speaking films it is of great advantage especially from the point of view of use, to arrange the sound sequence and the picture sequence upon one and the same piece of material (film).

In this procedure, however, there frequently occur in consequence of the changing lighting conditions in the cinematographing process, changes in the degree of exposure of the silver bromide coating, and this causes the picture sequence to be either overexposed or underexposed.

As the same film, however, carries close to the picture sequence the normally exposed sound sequence, these difficulties resulting from differences in exposure cannot be remedied in the case of combined negatives, by developing practices such as by weakening, strengthening and so forth. They can only be remedied by subjecting the underexposed or the overexposed portions of the negative to separate appropriate treatments.

Technically, this treatment is practically impossible so long as the two sequences - picture and sound - are photographed upon the same film strip.

According to the present invention the difficulty is overcome by either employing entirely separate films for the simultaneous photographing of the sound and picture negatives, or films which are connected during the photographing, but which are separated from one another before the developing, then separately developing the negatives if and in the manner required to remedy the difficulties, and then printing both sequences - picture

legal representatives or assigns more than twelve months before the above entitled application; was not in public use or on sale in the United States for more than two years before the above entitled application; and that said subject matter of invention has not been abandoned.

Joseph Cassalle

Subscribed and sworn to before me this 19th day of August, 1931.

Cyrus B. Follmer
CYRUS B. FOLLMER
United States Consul
vice

SERVICE No. 6260

$2.--P.44 Rules

SEP 9 1930
U. S. PATENT OFFICE

SEP 3 31
MAIL DIVISION
SEP 3 31
U.S. PATENT OFFICE

This invention relates to processes for producing combined sound and motion picture films.

In the production of speaking films it is of great advantage especially from the point of view of use, to arrange the sound sequence and the picture sequence upon one and the same piece of material (film).

In this procedure, however, there frequently occur in consequence of the changing lighting conditions in the cinematographing process, changes in the degree of exposure of the silver bromide coating, and this causes the picture sequence to be either overexposed or underexposed.

As the same film, however, carries close to the picture sequence the normally exposed sound sequence, these difficulties resulting from differences in exposure cannot be remedied in the case of combined negatives, by developing practices such as by weakening, strengthening and so forth. They can only be remedied by subjecting the underexposed or the overexposed portions of the negative to separate appropriate treatments.

Technically, this treatment is practically impossible so long as the two sequences - picture and sound - are photographed upon the same film strip.

According to the present invention the difficulty is overcome by either employing entirely separate films for the simultaneous photographing of the sound and picture negatives, or films which are connected during the photographing, but which are separated from one another before the developing, then separately developing the negatives if and in the manner required to remedy the difficulties, and then printing both sequences - picture and sound - on the different portions of the same positive film.

The synchronism is assured in both cases by the perforations and/or by corresponding marks. The production of the combined positive film can take place by copying the two negative films - sound and picture - preferably consecutively upon the same positive film.

In the drawing:

Figure 1 shows the two records, the sound record and the picture record, separately.

Figure 2 shows a combined record, and

Figure 3 shows a modified form of the same.

If for the record two separate films with standard perforation are used two negatives are produced as shown in Fig. 1. The sound record comprises the row of tones t, the picture record comprises the row of pictures b. The tone row is preferably arranged near one edge of the film. The two negatives are then copied on a single film as shown in Fig. 2. If for the two records a common film is used, this has preferably the form shown in Fig. 3. This film comprises between two rows of perforations the picture record b and the sound record t. Before the developing the film is separated at D or at u. If the sounds have to be recorded at the side of the picture record, outside one row of perforations, a film strip like the one shown in Fig. 2 is produced on which the picture record is between two rows of perforations whilst the sound record is arranged at one edge of the film strip outside the corresponding row of perforations.

One can, however, previous to the printing, unite longitudinally together the two developed negative films, and then copy this so united negative in the usual manner.

Other benefits may also be derived from the broader aspects of the invention, i.e., from employing separate or separable film areas for the recording of the sound and picture negatives, and then printing both the sound and picture sequences on different portions of the same positive film.

In the following claims where reference is made to a "length of film" upon which a sound record is recorded, such "length of film" shall be interpreted as referring to a strip of film which may be either entirely separate from or merely separable from the film strip carrying the picture sequence.

While the invention has been described in detail with respect to certain particular preferred examples thereof which give satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

5. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the two negatives in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to form the sound sequence at one side of and along the picture sequence.

6. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon different longitudinally extending portions of the same sensitized film, to form the sound sequence at one side of and along the picture sequence.

7. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, so that the picture and sound negatives may be separately developed in a manner appropriate for each, and printing the sound and picture negatives respectively upon the same face of the same sensitized film at different longitudinally extending portions thereof, to form the sound sequence at one side of and along the picture sequence.

8. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing said negative picture record upon a portion of a sensitized film not exposed to a sound record, and photographing the negative sound record on the same face of said last film and at a portion thereof not exposed to the picture record.

9. The method of producing a talking moving picture record on a single film which comprises photographing simultaneously upon separate films the picture and the sound to form separate negatives, photographing said negative picture record upon a portion of a sensitized film not exposed to a sound record, and photographing the negative sound record on the same face of said last film and at a portion thereof not exposed to the picture record, said last two photographing steps being performed consecutively.

10. A process for producing a combined sound and picture positive film, for sound motion pictures, comprising, photographing a sequence of pictures on one length of film, and photographing on another length of film a corresponding sequence of sound vibrations to accompany the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

11. A process for producing a combined sound and picture positive film, for talking moving pictures, comprising, photographing a sequence of pictures on one length of film, and simultaneously photographing on another length of film a corresponding sequence of sounds accompanying the action, separately developing the records of said two lengths of film in a manner appropriate for each, and printing such developed sound and picture records respectively upon different longitudinally extending portions of a single sensitized film, to form the sound sequence at one side of and along the picture sequence.

ISSUE DIVISION
NOV 19 1931
U. S. PATENT OFFICE

35-

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,
Ser. No. 547,860,
Filed March 29, 1922,
For Processes for Producing Combined Sound and Picture Films
Div. 7, Room 104.
Patent No. 1,825,598, granted September 29, 1931.

New York, N.Y.,
November 18, 1931.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

It is respectfully requested that a certificate of correction be issued in connection with the above entitled patent to correct the following printer's errors:

(a) In the specification, page 1, line 71, the reference character "p" should be - D -.

(b) In claim 10, page 3, line 11, the word "accompanying" should be - accompany -.

The original patent is enclosed in order that the certificate of correction may be attached thereto.

Inasmuch as several suits are about to be filed under this patent, it is respectfully requested that the issuance of the certificate of correction be expedited in so far as possible.

Respectfully submitted,
Ward Analy & Neal
Attorneys for Vogt, et al.

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

ABS
808

LETTER No.

DEPARTMENT OF COMMERCE

36

UNITED STATES PATENT OFFICE

WASHINGTON

December 2, 1931.

In the matter of
Letters Patent No. 1,825,598,
Vogt, Massolle, and Engl, Assors.,
September 29, 1931,
Ward and Crosby, attorneys.

REPORT OF THE CHIEF OF THE ISSUE AND GAZETTE DIVISION.

Attorneys return Letters Patent requesting that a certificate be issued correcting certain errors as set forth in the accompanying letter.

The first alleged error is referred to the Examiner for report.

The second error is chargeable to the Printer.

Respectfully,

John Thomas

Chief of the Issue Division.

To Division 7 for report.

REPORT OF THE EXAMINER OF DIV. 7

Reference character "p" comprising the first alleged error is correct in the patent as printed as it agrees with the drawing and the written description in line 1, page 2 of the amendment of Nov. 24, 1[illegible].

Character "D" appears only in an unentered specification attached to supplemental oaths apparently to comply with the last sentence of Rule 48, filed with the final fee, September 3, 1931.

Respectfully,

O. G. Harbo

To Commissioner of Patents.

Examiner, Div. 7

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

DEPARTMENT OF COMMERCE EMG

UNITED STATES PATENT OFFICE

WASHINGTON

U. S. PATENT OFFICE
COMMISSIONER'S OFFICE
DEC 4 - 1931
COPY MAILED

37

December 4, 1931

In re Patent No. 1,825,598,
Vogt, Lassolle and Engl,
Process for Producing Combined
Sound and Picture Films.

Request for Certificate of Correction.

Consideration has been given to your request for a certificate of correction.

As to the alleged error (a), the record shows that the patent is printed in accordance with the copy furnished this Office. The reference character "D" appeared in a specification attached to certain supplemental oaths but that specification was not entered in lieu of the original specification or as correcting any alleged errors therein. Consequently no certificate of correction can be issued with reference to that.

As to the second error, while it is regretted that it should have been made, it is thought that the meaning is obvious and therefore the issuance of a certificate of correction is not justified.

The patent is returned herewith.

THOMAS E. ROBERTSON,
Commissioner.

By R. F. Whitehead
Law Examiner.
3/84

Messrs. Ward, Crosby & Neal,
225 Broadway, New York, N. Y.

ISSUE DIVISION
Dec 8/31
U. S. PATENT OFFICE
3 P m

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,

Ser. No. 547,860,

Filed March 29, 1922,

For Processes for Producing Combined Sound and Picture Films

Div. 7, Room 104.

Patent No. 1,825,598, granted September 29, 1931.

New York, N.Y.,

December 7, 1931.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:

In reference to the Law Examiner's letter of December 4, 1931, in connection with the error in the printing of claim 10, for which a certificate of correction was asked, it is respectfully requested that the refusal to issue such certificate be reconsidered and that such a certificate be issued.

While it will be apparent that some error is involved in printing, it will be difficult for the reader to determine exactly what the error is without reference to the correct version in the file wrapper.

APPROVED

DEC 8 - 1931

For the Commissioner of Patents

Respectfully submitted,

Ward Cooley & Neal

Attorneys for Vogt, et al.

MAIL ROOM
DEC 19 1931
PATENT OFFICE

~~Report No. 400.~~

#41

orm 789

District Court of the United States

DISTRICT OF DELAWARE.

HONORABLE COMMISSIONER OF PATENTS
Washington D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 20th day of November, 193 1, in this court an action, suit, or proceeding No. 925 In Equity entitled:

Name American Tri-Ergon Corporation, ..., Plaintiff,

Address a corporation of New York, ...

versus

Name R.K.O. Radio Pictures, Inc., ..., Defendant,

Address a corporation of Delaware, ...

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1,825,598	Sept. 29,1931	Hans Vogt, Joseph Massolle and Josef Engl.

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

PATENT NO.	DATE OF PATENT	PATENTEE
1		
2		
3		
4		
5		

In the above-entitled case the following decision has been rendered or decree issued:

.....

.....

IN WITNESS WHEREOF I have affixed my hand this eighteenth day of December, 1931, at Wilmington, Delaware.

.....

ISSUE DIVISION
Dec 8/31
U. S. PATENT OFFICE
3 P m

IN THE UNITED STATES PATENT OFFICE

In re application of HANS VOGT, et al.,

Ser. No. 547,860,

Filed March 29, 1922,

For Processes for Producing Combined Sound and Picture Films

Div. 7, Room 104.

Patent No. 1,825,598, granted September 29, 1931.

New York, N.Y.,

December 7, 1931.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:

In reference to the Law Examiner's letter of December 4, 1931, in connection with the error in the printing of claim 10, for which a certificate of correction was asked, it is respectfully requested that the refusal to issue such certificate be reconsidered and that such a certificate be issued.

While it will be apparent that some error is involved in printing, it will be difficult for the reader to determine exactly what the error is without reference to the correct version in the file wrapper.

APPROVED

DEC 8 - 1931

R. F. Whitehead

For the Commissioner of Patents

Respectfully submitted,

Mann Conley & Neal

Attorneys for Vogt, et al.

Form 789

District Court of the United States

DISTRICT OF DELAWARE.

HONORABLE COMMISSIONER OF PATENTS
Washington D. C.

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Name American Tri-Ergon Corporation, Plaintiff,

Address a corporation of New York,

versus

Name R.K.O. Radio Pictures, Inc., Defendant,

Address a corporation of Delaware,

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1,825,598	Sept. 29,1931	Hans Vogt, Joseph Massolle and Josef Engl.

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

	PATENT NO.	DATE OF PATENT	PATENTEE
1			
2			
3			
4			
5			

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF I have affixed my hand this eighteenth day of December, 193 1, at Wilmington, Delaware.

H. Wallace Jr.
Clerk of said Court.

Plaintiff's Exhibit No. 4. 1699

Paper No. 55
ES/GAC

Final Hearing
May 2, 1928.

In the United States Patent Office.

Patent Interference No. 53103.

De Forest vs. Vogt, Massolle and Engl. 1700

Recording Sounds.

Patent granted Lee De Forest April 8, 1924, No. 1,489,314, on an application filed July 16, 1921, No. 485,332.

Application of Hans Vogt, Joseph Massolle and Josef Engl filed March 29, 1922, No. 547,860.

1701

MESSRS. DARBY & DARBY for De Forest.

MESSRS. WARD & CROSBY for Vogt, Massolle and Engl.

This controversy involves talking motion pictures and has to do particularly with a process for making films. It was found that if the picture and sound were recorded directly upon the same film either one or the other would be unsatisfactory, because the same amount of light is not suitable for recording both picture and

1702 *Plaintiff's Exhibit No. 4.*

sound. According to the process of this interference the picture and sound are recorded on separate films and thereafter combined. It is to be particularly observed that each of the two counts specifies that the picture and sound are to be simultaneously photographed.

This interference was set up with De Forest as the senior party. On motion decided April 13, 1926, Vogt *et al.* were given the benefit of their German application date of April 14, 1921, thereupon becoming the senior party.

1703

The invention has been patented to the party De Forest. Vogt *et al.* copied the two counts from the De Forest patent but they were rejected by the primary examiner. The rejection was reversed by the Examiners-in-Chief and in their opinion they mentioned the word "simultaneously" occuring in both claims as distinguishing these claims from the Greenfelder patent cited. Under the circumstances the usual rule in interferences that each limitation of the claims is to be deemed essential has particular force. The counts read as follows:

1704

> Count 1: The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film.
>
> Count 2: The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film be-

 1705

tween the marginal edge and the sprocket perforations thereof.

The testimony submitted by De Forest fails to prove that he had conceived this feature of simultaneously photographing the picture and the sound prior to his filing date. The notes in the De Forest notebook relied upon do not include this feature, and the corroborating witnesses do not support De Forest with respect to this feature of simultaneity. Furthermore, these corroborating witnesses had no means of fixing 1706
the date.

Garity knows that De Forest kept a running notebook with which he was conversant in a general way, and he recognizes the two notebooks put into evidence (XQ. 41, p. 45). He states, however, in answer to XQ. 40, page 45, that he is not able to say that a particular record was made on a certain date, his memory not going back so far. The notes purport to have been made December, 1920, and January and April, 1921. Vogt *et al.* having a filing date under the International Convention of April 14, 1921, can- 1707
not be considered as anticipated by this testimony by Garity.

The witness Senner likewise has no way of fixing any date prior to the filing date of Vogt *et al.* De Forest purchased from Senner's employer on February 18, 1921, a camera, and Senner is of the impression that it was within a week or ten days after this purchase that De Forest talked with him about producing talking motion pictures. The dates here are so close, however, that the impression of the witness is not sufficiently reliable to overcome the record date of Vogt *et al.*

1708 *Plaintiff's Exhibit No. 4.*

It is also true that the testimony of neither of these witnesses includes the feature of simultaneity. In fact the answer of Garity to Q. 20, p. 41, seems to contradict the thought of simultaneity, but at all events, this thought is not affirmatively present. The testimony of Torma does not appear to be regarded by De Forest as supporting his case for priority of conception.

De Forest being admittedly the last to reduce to practice, his reduction to practice consisting
1709 of the filing of his application, July 16, 1921, he could in any event prevail only if he establishes diligence between the German filing date of the other party and his own filing date. The German filing, as already stated, was April 14, 1921, so that De Forest would have the duty of proving diligence during this interval of three months.

It is not urged upon De Forest's behalf that he was doing anything with the present invention from Vogt *et al's* record date until he submitted to his patent counsel, on June 30, 1921, the data for his application. According to the
1710 testimony of his assistant Garity an actual reduction to practice could have been made without difficulty.

It is the contention on behalf of De Forest that he was working on the problem of recording sound, and should be credited with diligence upon the basis of this activity. But this work does not amount to diligence in reducing to practice an invention involving the combination of sound and pictures. There are authorities to the effect that diligence on a whole machine may be considered as diligence toward the elements of such machine, but the present case is not of that class and De Forest can not be credited with dili-

gence for one invention upon the basis of what he was doing toward an independent, even if related, invention. On the ground that De Forest has established no date earlier than the record date of Vogt *et al.*, and on the further ground that he was not diligent during the three months between Vogt *et al's* filing date and his own filing date, it is ruled that Vogt *et al.* are the first inventors.

Priority of invention of the subject matter in issue is hereby awarded to Hans. Vogt, Joseph Massolle and Josef Engl, the senior party. 1712

Limit of appeal: August 3, 1928.

H. I. Houston,
Examiner of Interferences.

July 14, 1928.

Plaintiff's Exhibit No. 4-A.

Appeal No. 153 Paper No.64
Decision.

Appeal No. 153 1713

Hearing:
Aug. 1, 1929.

In the United States Patent Office

Before the Board of Appeals

De Forest vs. Vogt, Massolle and Engl

Patent Interference No. 53,103 between the patent granted Lee De Forest April 8, 1924, No.

1714 *Plaintiff's Exhibit No. 4a.*

1,489,314, on an application filed July 16, 1921, Ser. No. 485,332, and the application of Hans Vogt, Joseph Massolle and Josef Engl filed March 29, 1922, Ser. No. 547,860. Recording Sounds.

MESSRS. DARBY & DARBY for De Forest.

MESSRS. WARD, CROSBY AND NEAL for Vogt *et al.*

1715

This is an appeal by De Forest from the decision of the Examiner of Interferences awarding priority of invention to Engl, Massolle and Vogt, the senior party, upon all the counts which read as follows:

1. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon
1716 separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film.

2. The method of producing talking moving pictures on the same film which comprises photographing simultaneously upon separate films the picture and the sound, and photographing the sound record on an unexposed portion of the picture film between the marginal edge and the sprocket perforations thereof.

The counts are claims 1 and 3 of the patent No. 1,489,314 of De Forest and the interference

1717

was originally declared with De Forest as the senior party but upon motion, Vogt *et al.*, by a decision dated April 13, 1926, were given the benefit of their German application date of April 14, 1921 and made the senior party.

The Examiner of Interferences points out that Vogt *et al.* copied the two counts from the De Forest patent but they were rejected by the Primary Examiner. The rejection was reversed by the Board of Examiners-in-Chief, and in their opinion they mentioned the word "simultaneously" occurring in both claims as distinguishing them from the Greenfelder patent cited against them. He therefore emphasized in his decision the word "simultaneously" as an essential limitation in the claims. He held that the testimony submitted by De Forest fails to prove that he had conceived this feature of *simultaneously* photographing the picture and the sound prior to his filing date.

1718

For proof of conception De Forest relied primarily upon his note book No. 2, De Forest Exhibit 1, in which, under date of December 28, 1920, is an entry which reads:

1719

> Developed this last 10 minutes until wholly fogged. This would be too long for cine picture. Hence will probably need to make two negatives (picture and sound) and print on same pos.

A second entry under date of Jan. 18, 1921 reads:

> Developed 11 minutes (very cold day) (longer development is best for sound film

1720 *Plaintiff's Exhibit No. 4a.*

> but not for picture. Hence will probably use 2 films.

These notes clearly indicate that as the sound and picture films require a different degree or time of development, it would be necessary to use two films and develop them separately. The Examiner of Interferences held that there was nothing in these notes to indicate that the sound and picture films were to be photographed "simultaneously" as required by the counts.

1721 De Forest, in his brief, contends that the object of the invention is to synchronize the sounds with the movement of the lips of a person in the picture and that it is at once apparent that the picture and sound must be recorded simultaneously. He further points out that on the motion to shift the burden of proof, the Law Examiner gave to Engl *et al.* the benefit of the filing date of his German application and if it be held that De Forest's testimony fails to support the issues, it is equally true that the German application of Engl *et al.* fails in the same respect.

1722 In the German application we find the following:

> According to the invention this difficulty is obviated in that for the making of the negatives either entirely separate films are provided or those which although still united during the recording are, however, detached from each other before the developing. Synchronism in both cases is insured by perforation and by suitable marks.

In our opinion the statements that the films are still united during the recording indicates

1723

that the record is made simultaneously on both films and this is further borne out by the statement that when separated for development purposes, the synchronization is insured by perforations and suitable marks so that they can be reconnected with proper registration. The same disclosure is found in the U. S. application of Engl *et al.*

As to the De Forest testimony, it appears that the reason why two films were to be used was that different degrees of development were necessary for the sound and picture negatives and it might seem obvious that the original idea which rendered this change necessary was that the sound and pictures were supposed to be photographed simultaneously. At this time only sound had been photographed in the laboratory which may be the reason why nothing was said in the notes as to simultaneous photography of the sound and picture. While the simultaneous exposure of the sound and picture negatives would seem to be the most obvious procedure, the brief of Engl *et al.* points out that other methods were known prior to De Forest's alleged conception, see Engl *et al.* brief, pages 24 and 25, and appear to be disclosed in the patent to Greenfelder No. 1,254,684 which was cited in the application of Engl *et al.*, and the burden was on De Forest, as the junior party, to prove his case. Furthermore, he must rely for corroboration upon his witnesses Garity and Senner. Garity has no way of fixing the dates when the entries were made in the note books and these dates are fixed only by De Forest's own testimony. Garity merely knows that he saw the note

1724

1725

1726 *Plaintiff's Exhibit No. 4a.*

books between December, 1920 and prior to De Forest's trip to Germany the last of July, 1921 and that, at some time, De Forest discussed the subject matter of the notes with him. Senner can fix no date except with relation to the purchase of a camera from him on February 18, 1921, and thinks that De Forest, within a week or ten days thereafter, brought some films to him for development which films contained both sound and picture records which were of unequal exposure.

1727 De Forest suggested that it would be best to use separate negatives while he discouraged this method and suggested the use of light of different intensity in making the records. This disclosure does not mention "simultaneous" exposure and the time between about March 1 and April 14, 1921, when Engl *et al.* entered the field is so short that a person testifying six or seven years after the event could hardly fix the time with sufficient definiteness. De Forest says (XQ. 74) that it was several weeks after he got the camera before he had the necessary attachment

1728 placed on same for recording sound on the same film with the picture. We must, therefore, agree with the Examiner of Interferences that De Forest has failed to established conception of the invention in issue prior to the constructive reduction to practice of the senior party.

Even if De Forest were given a conception as of January 1, 1921, the date set up in his preliminary statement, he would have to prove diligence from just prior to April 14, 1921 when Engl *et al.* entered the field, up to his filing date of July 16, 1921. There is no testimony which clearly establishes any work done on the inven-

 1729

tion in issue from January 1, 1921 up to April 14, 1921 and De Forest seeks to rely upon his work on the general subject of talking moving pictures. This work was the subject of the other interference No. 51,947, and the present invention relates to entirely different subject matter. His note books show that he had already obtained goods results in making sound records and after obtaining the moving picture camera on February 18, 1921 he could have coupled the two cameras without great difficulty and reduced the invention to practice, but on page 13 of his record (Q. 25) he admits that he had not attempted to actually use the invention of the interference prior to filing his application on July 16, 1921. This is also verified by the testimony of Garity on page 41, Q. 20, page 47, XQ. 52, and page 48, XQ. 55. 1730

De Forest has failed to prove conception prior to his filing date and even if he had he has not established the diligence required of him.

The decision of the Examiner of Interferences is affirmed. 1731

WM. A. KIMMAN)
First Assistant Commissioner) Board
FRANK C. SKINNER) of
Examiner-in-Chief) Appeals
G. R. IDE)

Jan. 7, 1930

1738 *Plaintiff's Exhibit No. 6.*

Patentansprüche.

1.) Verfahren zur Herstellung kombinierter Tonbildfilme, wobei die Ton-Bold-Positive auf einen gemeinsamen Film kopiert sind, dadurch gekennzeichnet, dass die Negative getrennt entwickelt werden.

2.) Verfahren zur Herstellung von kombinierten Tonbildfilmen bemäss Anspruch 1, dadurch
1739 gekennzeichnet, dass die Aufnahme der Tonzeichen und der Reihenbilder auf getdennten Filmen erfolgt.

3.) Verfahren zur Herstellung van kombinierten Tonbildfilmen gemäss Anspruch 1, dadurch gekennzeichnet, dass die Aufnahme der Tonzeichen und der Reihnenbilder auf einen gemeinsamen Film erfolgt, der nachher getrennt wird.

4.) Verfahren zur Herstellung von kombinierten Tonbildfilmen gemäss Anspruch 1-3, dadurch gekennzeichnet, dass die Negative nach erfolgter
1740 Behandlung der Länge nach miteinander vereinigt werden.

R. A.
Si.B

Translation of German patent application no. V.16431 VI/57a2 to Hans Vogt, Joseph Massolle, and Dr. Joseph Engl.

CERTIFICATE.

Messrs. Hans Vogt, of Berlin-Wilmersdorf, Joseph Massolle, and Dr. Joseph Engl, of Ber-

Plaintiff's Exhibit No. 6. 1741

lin-Grunewald, have filed in Germany an application for a patent of invention at the Reichspatentamt on April 14, 1921 for:

"Method of making combination fono-films."

The document hereunto attached is a true and exact copy of the original papers of this application.

Berlin, December 9, 1925. 1742
The President of the Reichspatentamt.
per
(signed) W. KAHL.

Embossed seal of the
German Patent Office
V.16431 VI/57a2.

Translation of Vogt et al German Application No. V 16431-VI/57a2. 1743

C. R. Forth
Chief Engineer

Tempelhof April 13, 1921
Albrechtstrasse 104.

Patent application.

"Method of producing combined sound picture films."

In the production of talking films it is of great advantage, particularly for operating reasons, to fix the sound-series and the picture-series upon one common material carrier (film). In this proc-

1744 *Plaintiff's Exhibit No. 6.*

ess, however, in consequence of varying lighting conditions in connection with cinematographic picture recording, differences frequently occur in the degree of illumination of the silver bromide layer with the result that the picture-series is overexposed or underexposed. But, since the same film also carries the always normally illuminated sound-series close to the picture-series, these differences, in combined negatives, cannot be compensated for by developing, toning down, intensifying, etc. They can only be eliminated if
1745 the underexposed and overexposed portions of the negative are subject to a separate, suitably adapted treatment.

Technically this is practically impossible as long as the two series of events are fixed on the same film.

According to this invention this difficulty is obviated in that for the production of the negatives, either entirely separate films are provided or those which although still united during the recording are, however, detached from each other before the developing. Synchronism in both cases
1746 is insured by the perforations and by corresponding marks.

The production of the positive films can be accomplished by having the two negative films, preferably one after the other, copied on to the same positive film. However, the two negatives can be previously pasted together in the lengthwise direction and the combined negative thus obtained copied in the usual manner.

Patent Claims.

1. Method of producing combined sound-picture films in which the sound-picture positives

1747

are copied on to one common film, distinguished thereby, that the negatives are separately developed.

2. Method of producing combined sound-picture film according to claim 1, distinguished thereby that the recording of the sound-series and of the picture-series is carried out on separate films.

3. Method of producing combined sound-picture films according to claim 1 distinguished thereby that the recording of the sound-series and of the picture-series is effected upon one common film which is subsequently divided.

1748

4. Method of producing combined sound-picture films according to claims 1 to 3 distinguished thereby that the negatives after treatment is completed are joined to each other lengthwise.

1749

PLAINTIFF'S EXHIBIT No. 13

584

Density Readings on Sensitometered Strips

Report No. _____ Date Nov. 26 1932.

Step No.	STRIP No. A		STRIP No.		STRIP No. B		STRIP No.		STRIP No.		STRIP No.	
1	PICTURE		DEVELOPER		SOUND		DEVELOPER					
2	DENSITIES		AVE. DENSITY	OPACITY	DENSITIES		AVE DENSITY	OPACITY				
3	.09	.09	.09	1.23								
4	.10	.12	.11	1.29	.09	.09	.09	1.23				
5	.13	.16	.145	1.395	.12	.11	.115	1.30				
6	.21	.22	.215	1.64	.16	.17	.165	1.46				
7	.26	.28	.27	1.86	.22	.25	.235	1.715				
8	.35	.36	.355	2.26	.33	.36	.345	2.21				
9	.42	.45	.435	2.72	.43	.48	.455	2.85				
10	.48	.52	.50	3.16	.53	.58	.555	3.58				
11	.57	.61	.59	3.88	.66	.70	.68	4.78				
12	.65	.70	.675	4.73	.78	.82	.80	6.30				
13	.75	.76	.755	5.69	.90	.92	.91	8.12				
14	.80	.80	.80	6.30	1.02	1.06	1.04	10.95				
15	.85	.87	.86	7.23	1.16	1.18	1.17	14.78				
16	.97	.97	.97	9.32	1.24	1.32	1.28	19.05				
17	1.02	1.01	1.015	10.35	1.28	1.38	1.33	21.4				
18	1.09	1.08	1.085	12.16	1.41	1.52	1.455	28.50				
19	1.15	1.19	1.17	14.77	1.56	1.60	1.58	38.00				
20	1.24	1.30	1.27	18.60	1.66	1.70	1.68	47.90				
21	1.31	1.40	1.355	22.60	1.82	1.84	1.83	67.50				
Fog	.08				.06	.07						

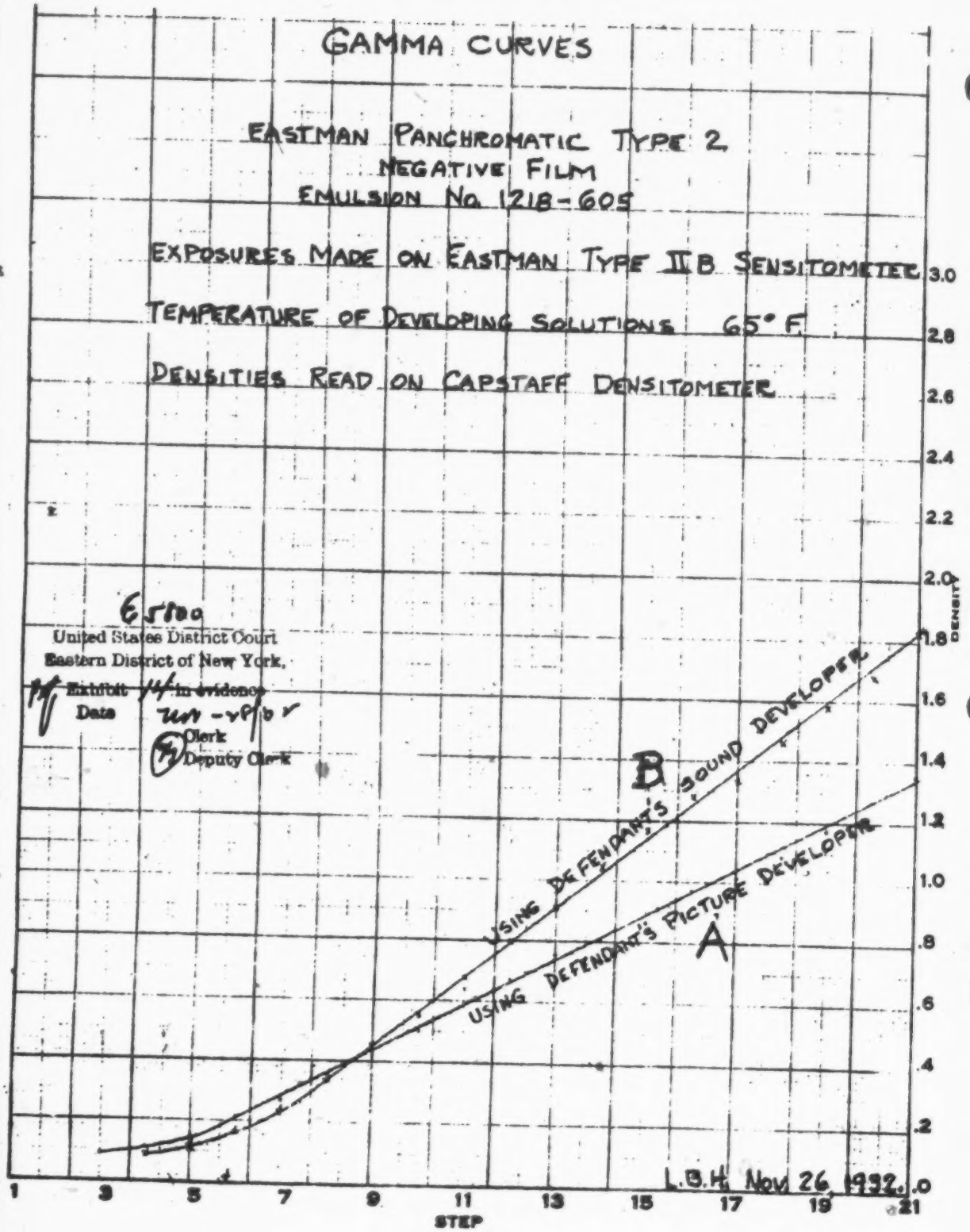
E 5800

United States District Court
Eastern District of New York
Plf. Exhibit 13 in evidence
Date Nov 28 1932
Clerk
Deputy Clerk

K P 18666

585

PLAINTIFF'S EXHIBIT No. 14



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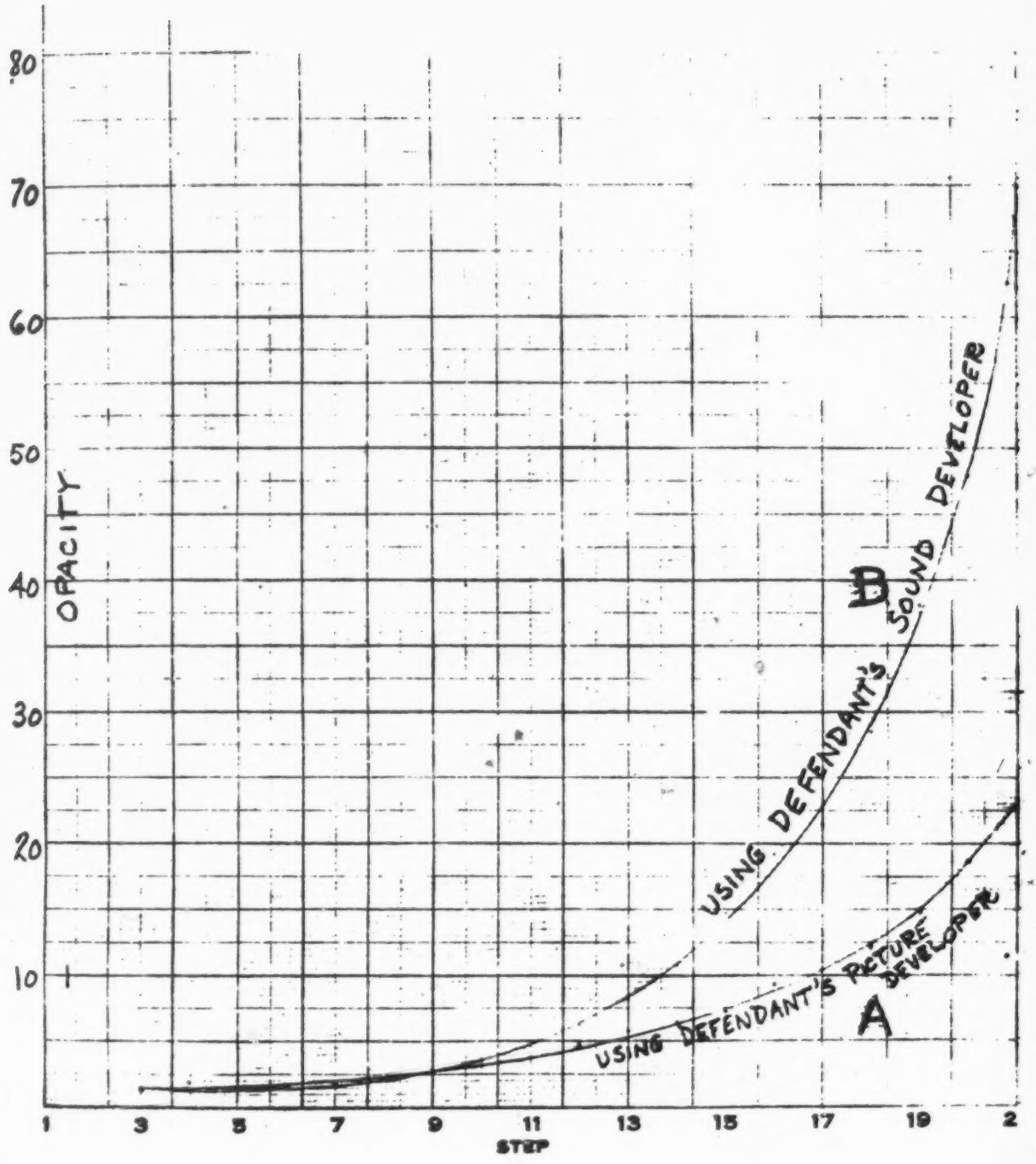


PLAINTIFF'S EXHIBIT No. 16

587

Checked Copy per LBH
from Ackton Tests

1 oz = 437.5 grains.

SOUND NEGATIVE

¼	54.6	Elon	- 14 lbs. 224 oz.
13¼	13.1	Sodium Sulphite	-498 lbs. 7968 oz.
¾	45.2	Hydrochinon	- 32 lbs. 512 oz.
½	26.26	Borax	- 21 lbs. 336 oz.
1¾	94.9	Boric Acid	-73.5 lbs. 1176 oz.
1 gal		Water to make	-600 gals. 600 gal

PICTURE NEGATIVE

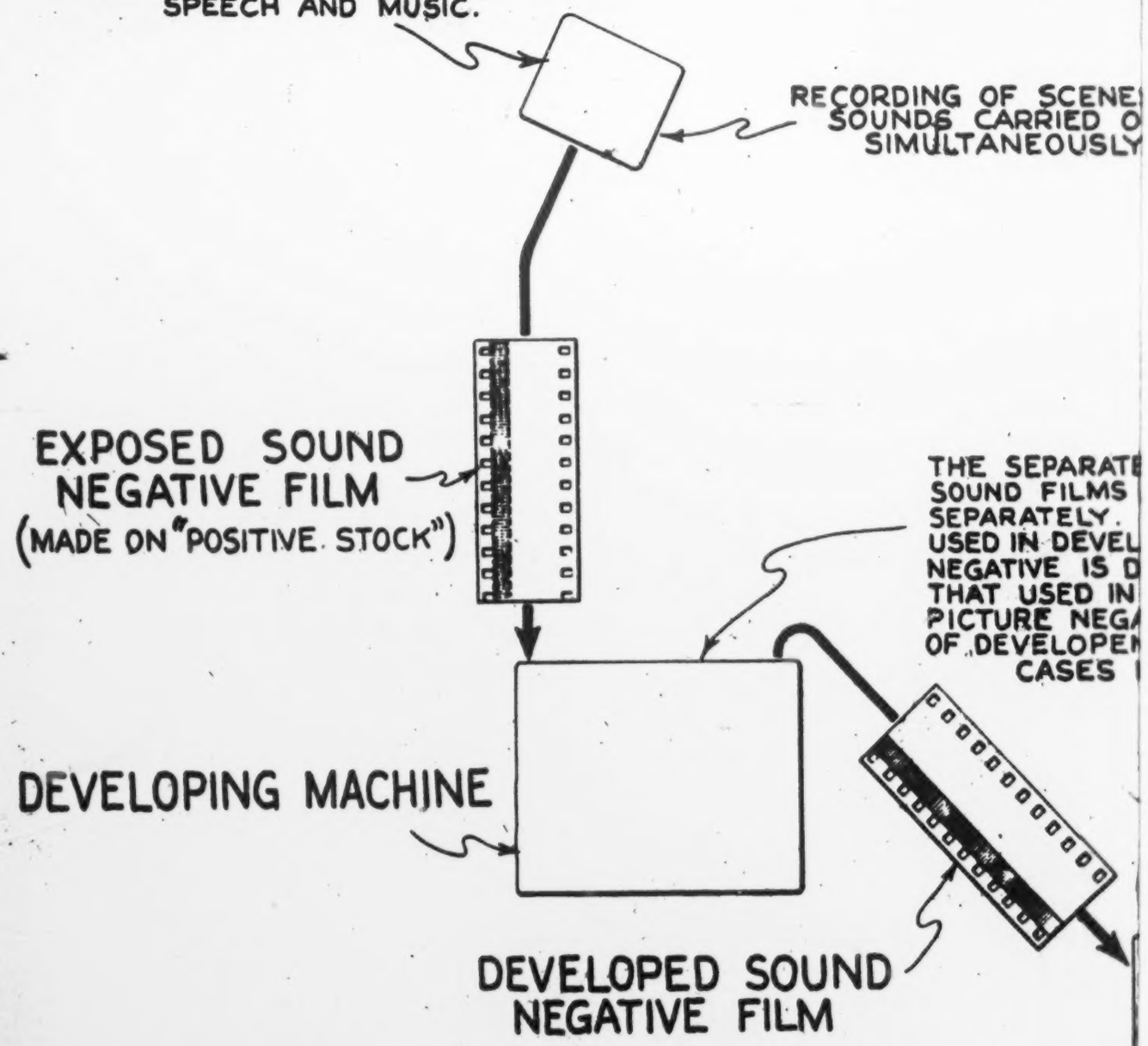
—	22.1	Elon	-2.75 lbs. 44 oz.
11	27.5	Sodium Sulphite	-420 lbs. 6720 oz
—	22.1	Hydrochinon	-2.75 lbs. 44 oz
—	13.85	Borax	- 1 lbs., 3 oz. 19 oz.
1 gal		Water to make	-600 gals. 600 gal.

CHART SHOWING PROCESS AS P

SERIES OF SCENES
SOUNDS SUCH
MUSIC OC

MEANS FOR PHOTOGRAPHICALLY RECORDING SERIES OF SOUND VIBRATIONS ACCOMPANYING THE SCENES, SUCH FOR EXAMPLE AS SPEECH AND MUSIC.

RECORDING OF SCENE
SOUNDS CARRIED O
SIMULTANEOUSLY



EXPOSED SOUND NEGATIVE FILM
(MADE ON "POSITIVE STOCK")

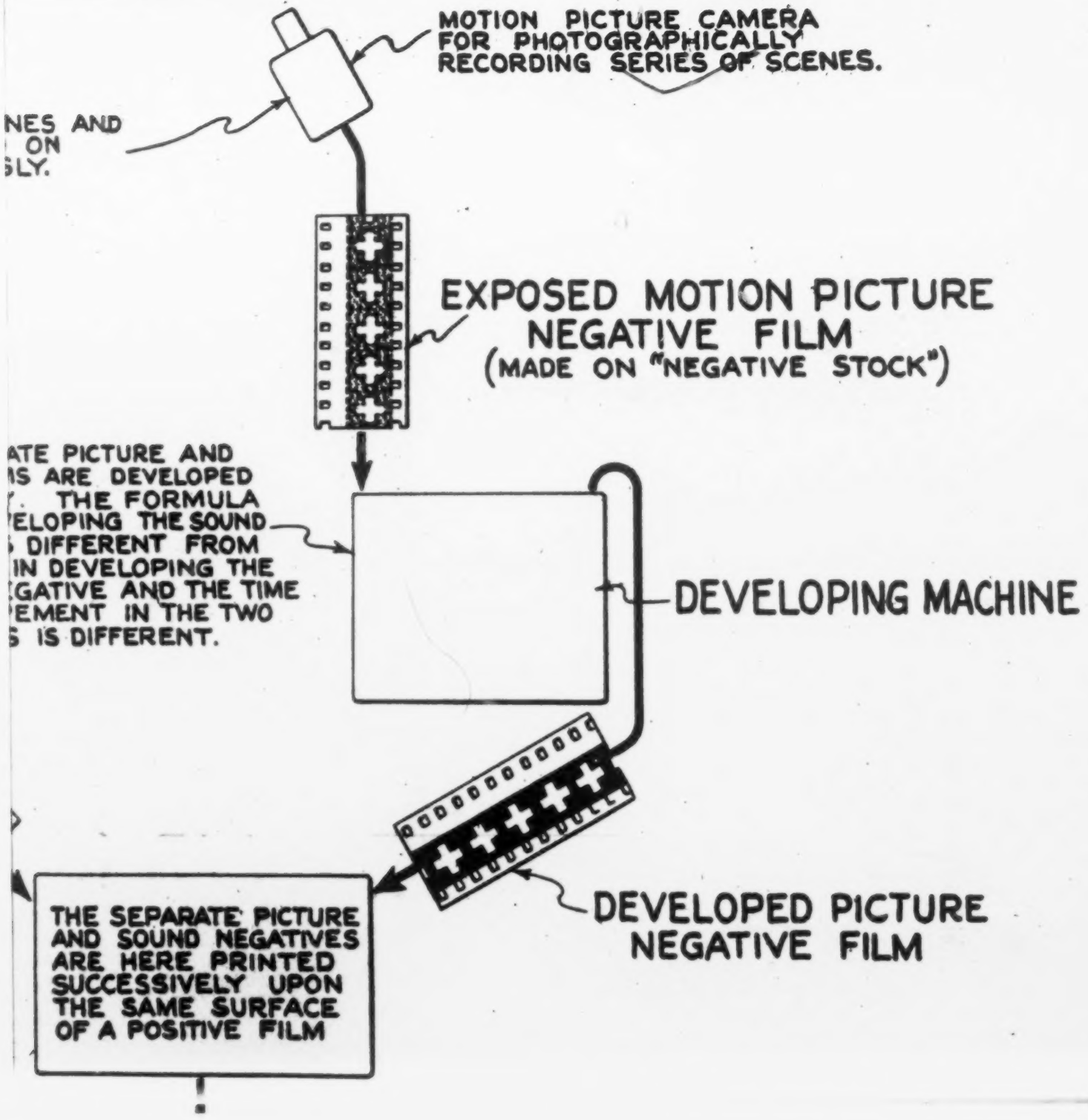
THE SEPARATE
SOUND FILMS
SEPARATELY.
USED IN DEVEL
NEGATIVE IS D
THAT USED IN
PICTURE NEGA
OF DEVELOPEN
CASES

DEVELOPING MACHINE

DEVELOPED SOUND NEGATIVE FILM

PER DEFENDANT'S ADMISSION

ES AND ACCOMPANYING
CH AS SPEECH AND
OCCUR HERE



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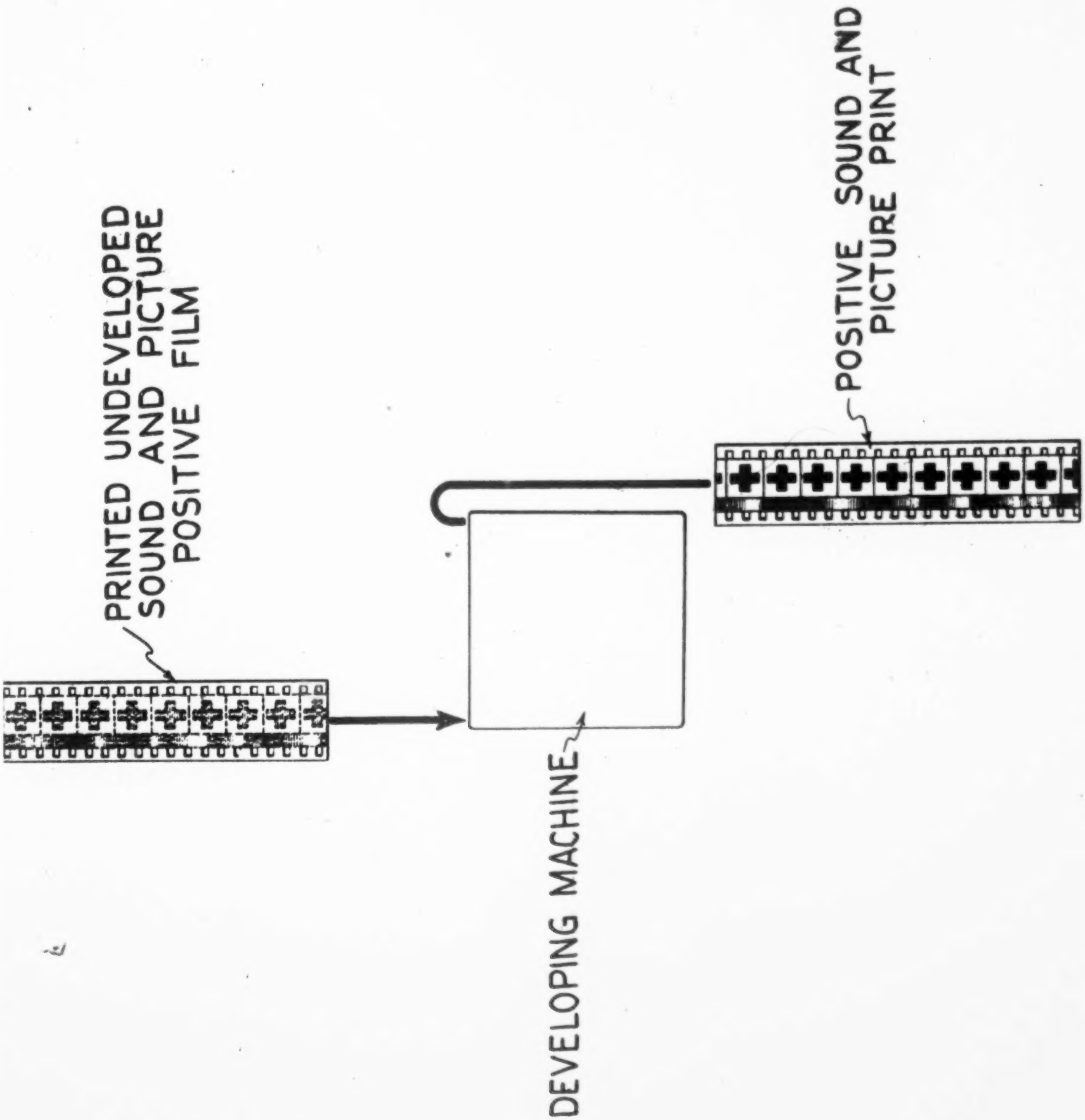
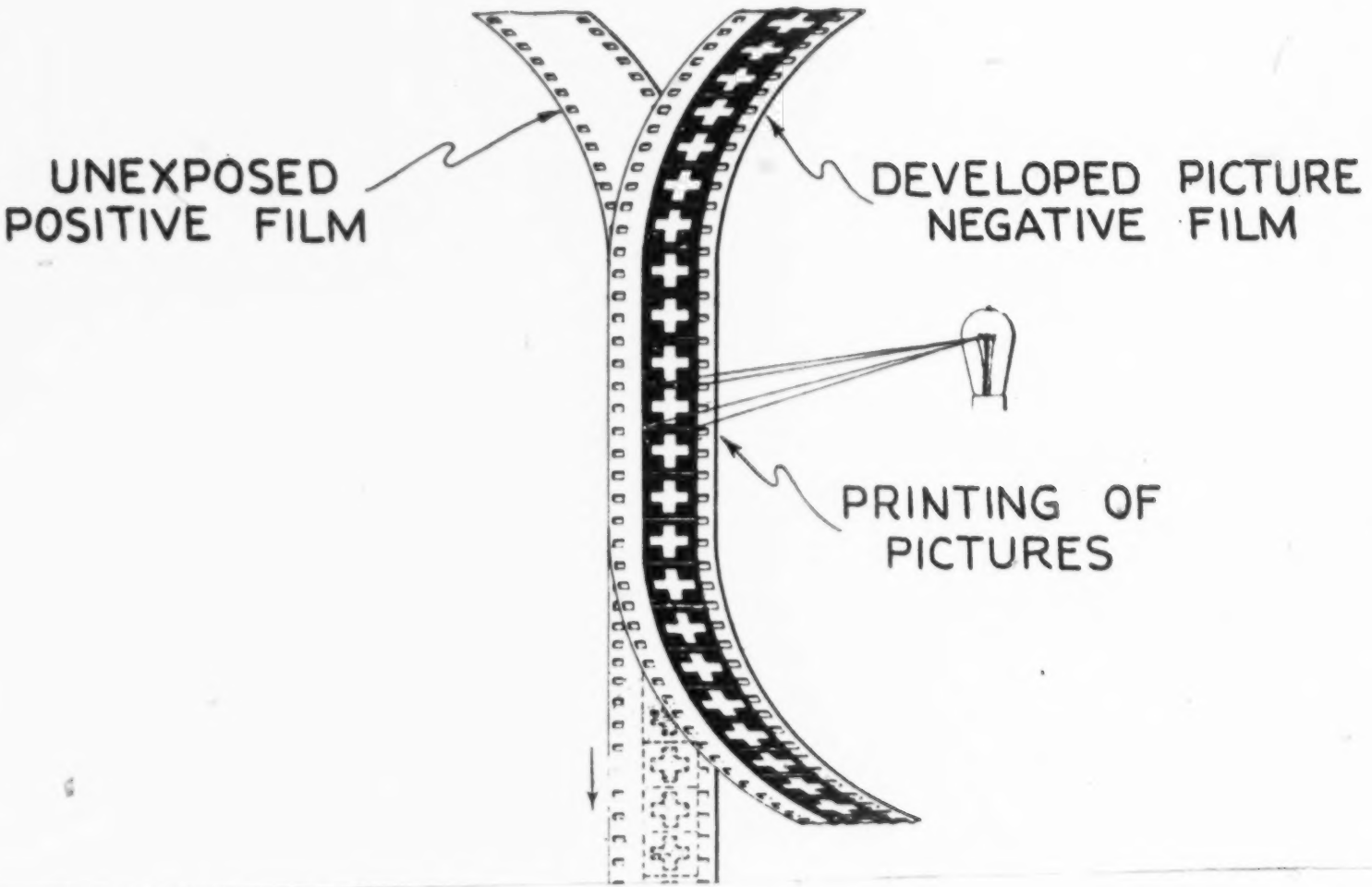
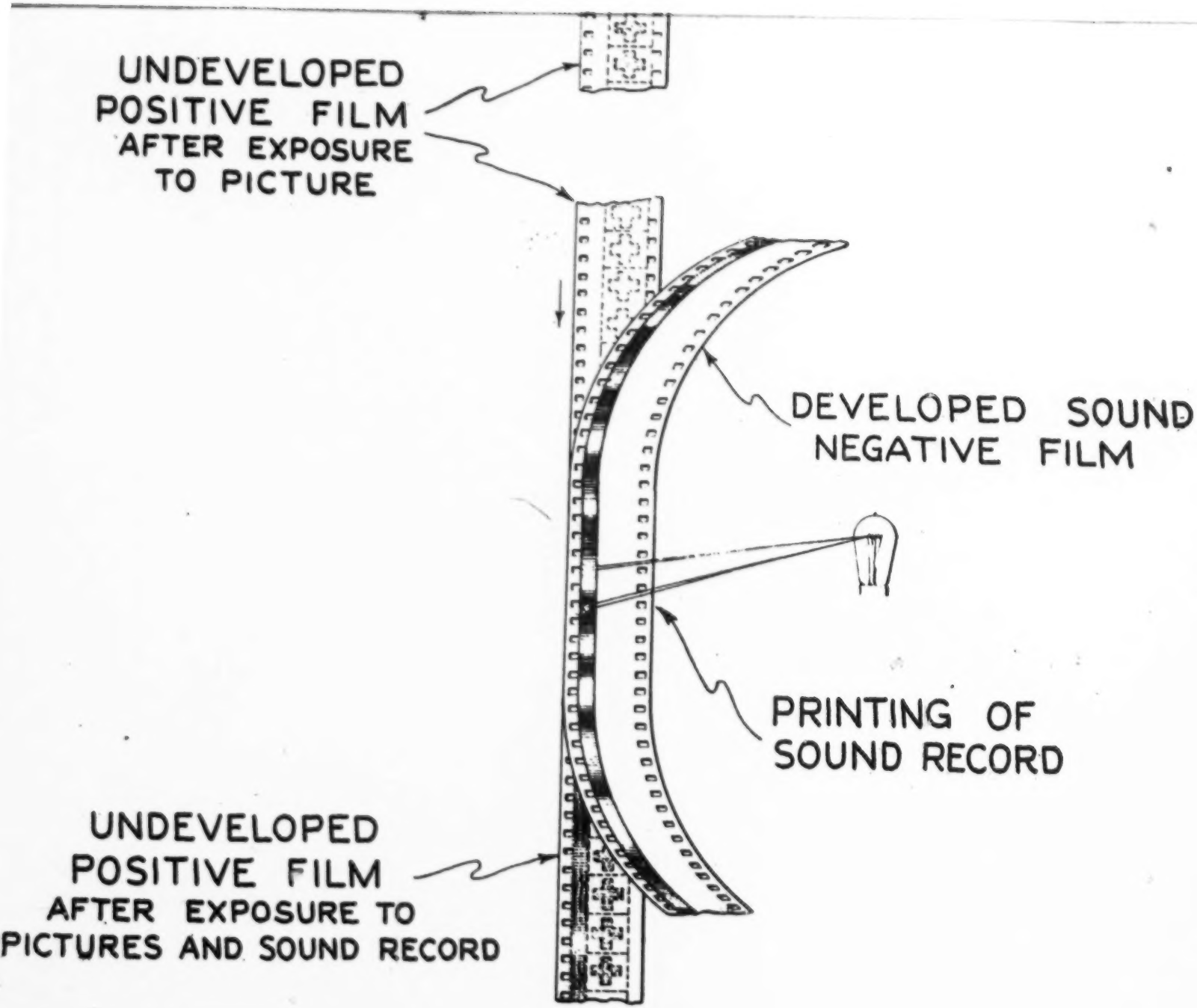


CHART SHOWING SUCCESSIVE PRINTING OF PICTURE AND SOUND NEGATIVES ON SINGLE POSITIVE FILM





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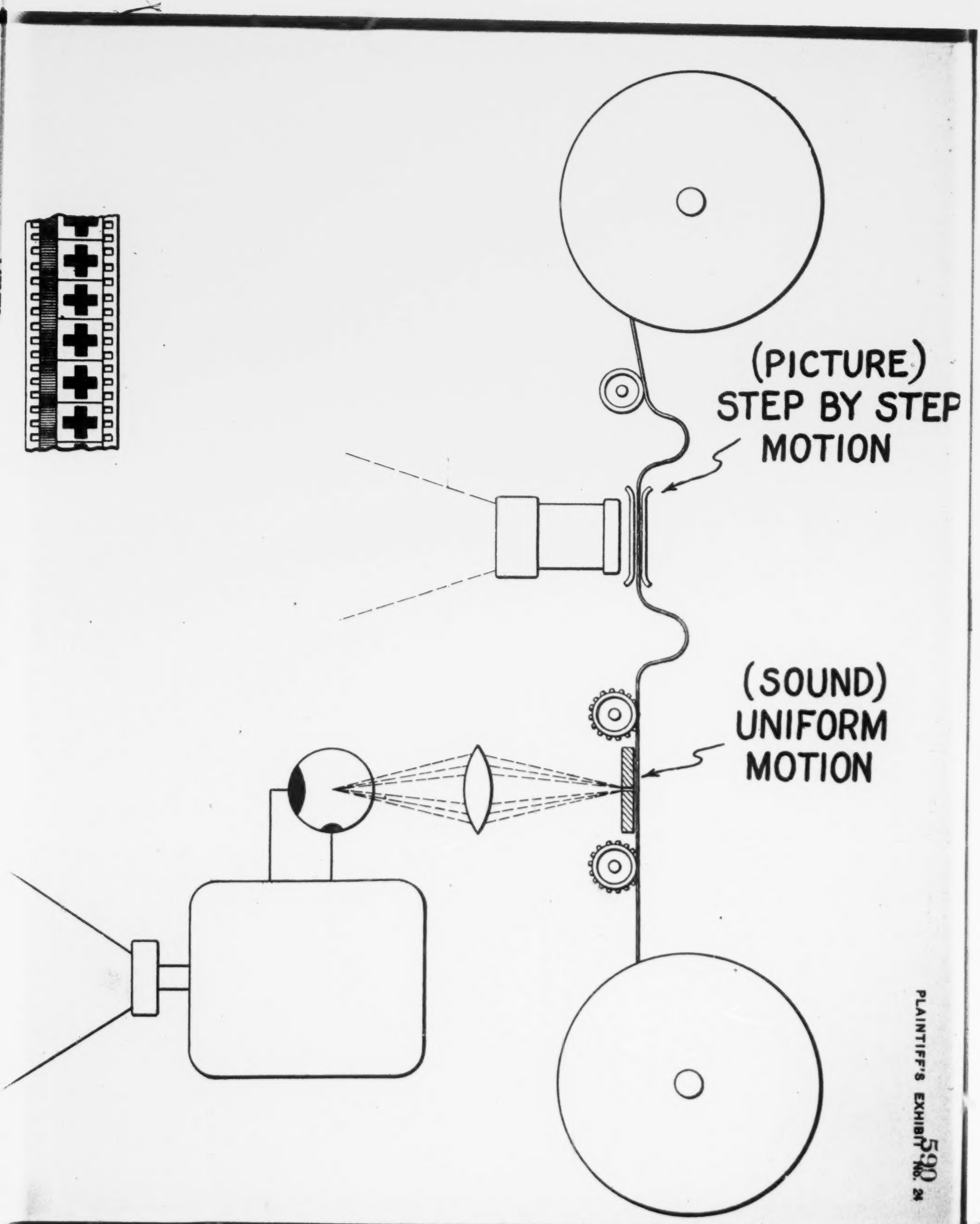


PLAINTIFF'S EXHIBIT NO. 24

591

Nov. 13, 1923. 1,473,976

E. E. RIES

SOUND RECORDING METHOD

Original Filed May 21, 1913 2 Sheets-Sheet 1

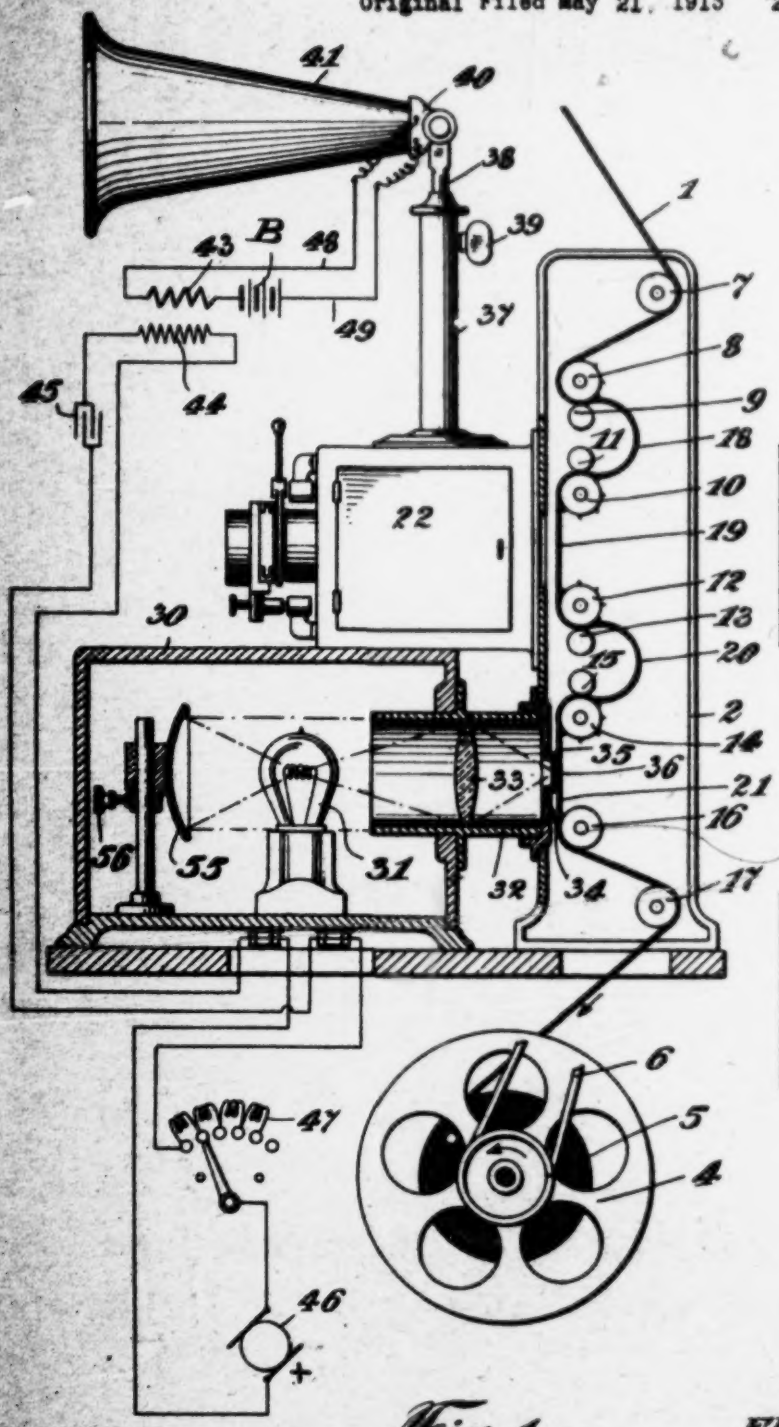


Fig. 1.

Fig. 2.

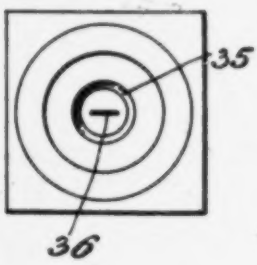


Fig. 3.

INVENTOR
Elias E. Ries
BY
George C. Sloan
his ATTORNEYS

592

Nov. 13, 1923. 1,473,976

E. E. RIES

SOUND RECORDING METHOD

Original Filed May 21, 1913 2 Sheets-Sheet 2

Fig. 4.

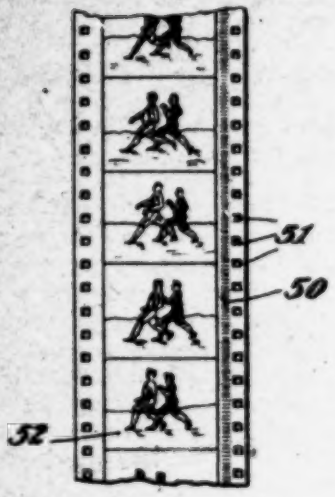


Fig. 5.

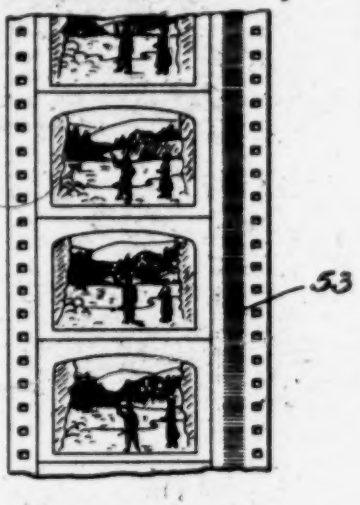


Fig. 7.

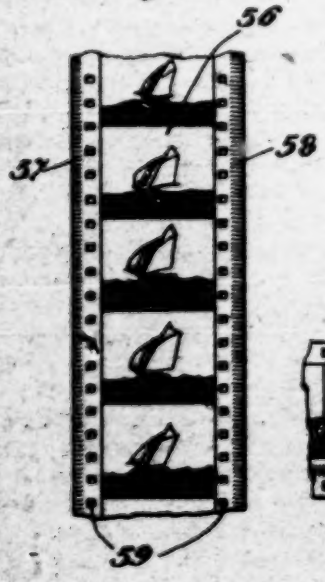


Fig. 8.

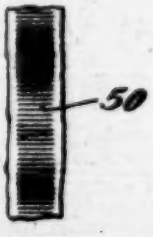
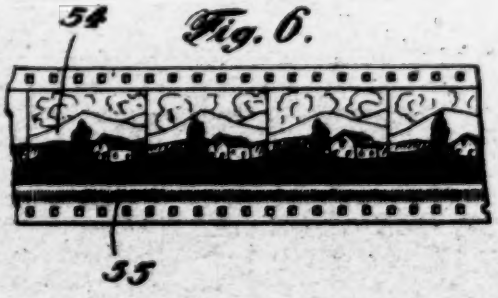


Fig. 6.



INVENTOR
Elias E. Ries
BY
George C. Dean
his ATTORNEYS

Patented Nov. 13, 1923. 1,473,976

UNITED STATES PATENT OFFICE.

ELIAS E. RIES, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN AUDIOSCOPE CO., INC., A CORPORATION OF NEW YORK.

SOUND-RECORDING METHOD.

Original application filed May 21, 1913, Serial No. 769,114. Divided and this application filed April 6, 1923. Serial No. 630,197.

To all whom it may concern:

Be it known that I, ELIAS E. RIES, a citizen of the United States, and resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound-Recording Methods, of which the following is a specification.

My present invention relates to methods for the production of photographic records of sounds, whether vocal, musical or of other character, and of type such that the original sound can be accurately reproduced therefrom with facility. The invention, although in certain broader aspects thereof applicable to the preparation of sound records alone, has its preferred application to the production of talking picture film record, that is, to moving picture films bearing a succession of photographs of successive stages in the action, and taken in usual manner, and provided with one or more continuous sound records laterally of the picture which represent the amplitudes and phases of vibrations of the sonorous action, such as music, speech or the like, occurring and recorded simultaneously with the visual action.

The sound record is produced according to my invention, by causing undulatory variations in light intensity similar in form to the vibrations of the air accompanying the sonorous action, and subjecting narrow portions of the film in rapid succession to the influence of the varying light. The source of light is preferably a tungsten or other metal filament lamp of small power, although an arc lamp may be used, and the variations are imposed preferably by the well-known singing arc principle, in which the sound vibrations act upon a microphone, which automatically varies resistance in circuit with the lamp, in conformity with the sound vibrations, and effects synchronously therewith, undulatory variations in the light intensity. The exposure of the film to the varying light at any moment is limited to a portion definitely restricted in the direction lengthwise of the film, by moving the photographic film or other sensitized surface in close proximity or contact with an opaque screen having a very small aperture. This aperture or window is preferably in the form of a narrow slit, and is of much greater width than length, the width being governed by the available space on the photographic film outside of the usual sprocket holes or between the line of pictures and the sprocket holes when the sound record is to form part of a motion picture. For sound records only, the width of the aperture may be much greater, if desired; but the length, that is the dimension taken lengthwise of the sound record, should always be proportional to the length of the shortest sound waves to be recorded. By moving the photographic film or other sensitized surface in close contact with the perforated screen, the exposed area of the sensitized surface is definitely fixed under all conditions of light, and all diffusion of light beyond the area of the aperture is prevented so far as possible. It is preferred, moreover, to focus the light from the lamp in a pointed or conical pencil directed upon the window opening, as by the use of an appropriate spherical lens. The film is moved preferably at a uniform rate past the window aperture or slit, in photographing the sonorous action, at a speed such as to differentiate the imprints of the denser and more attenuated parts of the sound waves photographed seriatim, the period of photographic exposure being so related to the speed of the record and to the duration of said portions of sound waves as to prevent blurring or overlapping. By the combined use of the photographic film moving in close contact with the screen having the small window aperture and the focusing lens, the light from the lamp acts uniformly over the exposed part of the film, so that sharper variations in light intensity are imposed upon the successively exposed parts of the film, producing more distinct and more substantial differentiations in translucency of the developed film for better sound reproduction, than if the light were more widely diffused over the film.

This is particularly true where a small power tungsten filament or equivalent lamp is employed, operating at substantially rated current consumption, where the candle power will vary relatively widely with the relatively small increments or decrements of current due to the operation upon the microphone of the air waves accompanying the vocal or other sound.

In the preferred application to talking pictures, in which the sound record is photographed concurrently with the taking of the pictures, and upon a strip or border of the film laterally of the pictures, the rate of film advance is limited by the exigencies of moving picture requirements to a speed in the order of about one foot per second. As the sound records, unlike the visual records, should be substantially continuous, rather than discreet, they cannot be conveniently produced on the intermittently moving film, and are consequently recorded at a portion of the film beyond the shutter opening of the picture taking lens, that is, at a region where the film moves at uniform speed. In this application, the length of film momentarily exposed is highly restricted, being of a length in the order of that of a small pin hole, which length is traversed by the film, even at the relatively slow speed of moving picture operation, in the minute interval of a fraction of a sound wave.

In order that my recording method may be more clearly understood, I have shown in the drawings, more or less diagrammatically, apparatus by which the method may be executed, as well as the physical product resulting from the operation of the apparatus.

In the drawings:—

Fig. 1 is a view more or less diagrammatic, illustrating apparatus by which the method can be executed,

Fig. 2 is a detail view on an enlarged scale of one form of aperture plate for the sound camera,

Fig. 3 is a view similar to Fig. 2 of a modification,

Fig. 4 is a fragmentary view of a portion of one embodiment of phonoscopic film, produced according to my invention,

Figs. 5, 6 and 7 are views similar to Fig. 4 of modified forms of films, and;

Fig. 8 is a fragmentary view on a greatly enlarged scale, illustrating the appearance of a small segment of the sound record.

The present application is a division of my copending application, Serial No. 769,114, filed May 2, 1913.

Referring now to Fig. 1, the film 1 in its downward travel through casing 2, passes in succession over the upper guide roll 7, upper positively-driven feed sprocket or drum 8, and its guide roller 9, by the action of which the film is unwound at a uniform rate of speed from the upper reel (not shown) and is caused to form the upper loop 18. The film then passes between the upper intermittent sprocket 10 and its guide roller 11, down between the lower intermittent sprocket 12 and its guide roller 13, and forming the lower loop 20, thence between lower positively-driven sprocket 14 and its guide roller 15, thence downward in a vertical line under the guide roller 16 and over the guide roller 17, from which it is wound onto the lower film reel 4. Reel 4 is provided with the usual "take-up" device provided with a friction pulley or its equivalent 5 and driven by belt 6 from some uniformly revolving portion of the camera, which may be operated by hand or by a small motor (not shown) provided with a differential speed control which insures the proper taking up of the lower portion of the film at a uniform speed irrespective of the increasing diameter of the reel.

It will be observed that in addition to the two loops 18 and 20, the film in its passage, forms two vertical face sections 19 and 21, each approximately a trifle longer than the width of a single picture. The lower vertical film section 21 is in the focal plane of the sound camera 30. The upper section 19 is in the focal plane of the lens (not shown) of a moving picture camera 22 of any suitable construction, which exposes the central portion of the film shown in Figs. 4, 5, 6 or 7. The edge portion or portions of the film on which the photographic sound record is to be received are shielded from the light and are thus left unexposed during the transit of the film behind the shutter-opening of the picture-taking lens, which is preferably located, as shown, a short distance above the sound camera 30.

This sound camera consists of a casing containing an independent source of light, which may be a small tungsten or other metal-filament incandescent electric lamp 31 capable of being operated at a high degree of incandescence, although an electric arc lamp or any other suitable source of light may be used, if desired. Behind the lamp is mounted a standard 54 carrying an adjustment reflector 55 which may be secured upon the standard by the thumb-screw 56. The light of the lamp direct or reflected is thrown, as shown, by dotted lines, upon a spherical lens 33 in a tube 32 in the front of the casing 30. The tube is closed at its forward end by an adjustable cap-piece 34 having a raised central portion 35 pierced with either a narrow slit 36 (Fig. 2) or a small round or square pin hole opening 36′ (Fig. 3), said cap-pieces being preferably interchangeable. The moving film 1 travels downward in close proximity to the raised portion 35 and with that portion of its surface on which the sound is to be

recorded, for instance, lateral strip or border 50 (Fig. 4) directly in front of the light opening 36.

Mounted at the upper rear portion of the apparatus is shown a standard 37 containing an adjustable sliding rod 38, that may be extended and turned to any position and locked against displacement by wing nut 39. The upper end of rod 37 has a swivel joint into which is clamped a telephone transmitter or microphone 40, which is provided with a large tapering horn or megaphone 41, designed and adapted to collect the atmospheric sound waves and to direct and focus them upon the diaphragm of the transmitter 40. The minimum height of the horn 41 when the device illustrated in Fig. 1 is used in connection with a portable motion picture camera, is such that the entire camera mechanism, including the casing 30 containing the photophonic recording appliances, may be mounted as a single, self-contained unit below the line of swing of the horn. The sound receiving horn 41, may, however, be located at any convenient point either alongside of the camera or at any desired or suitable distance from the scene and sounds, to be photographed.

The transmitter 40, whether mounted on the apparatus or located at a distance therefrom, is in electrical circuit through the line wires 48 and 49, with a battery B in series with the primary winding 43 of an induction coil, whose secondary winding 44 is in series with a condenser 45 and with the terminals of the lamp 31, as shown. All of these devices in practice, are preferably included within the casing 30 or other enclosed portion of the apparatus. The terminals of the lamp 31 are likewise independently connected in the usual manner, by means of the circuit wires shown, with a suitable source of direct current, such as the generator 46, the voltage of which is regulated by rheostat 47.

In the operation of recording talking pictures, the visible phase of the performance or other occurrence combining visible and sonorous action, is recorded by the camera 22, in the usual manner for taking moving pictures. The horn 41 is disposed in appropriate relation to intercept the sound waves and the circuit of the lamp 31 is closed. The film moves intermittently between the rollers 10 and 12, taking moving pictures on the film section 19 in the regular manner, while the film section 21 moves past the pin hole or other narrow slit 36 in the sound recording camera, continuously at a uniform speed, usually about one foot per second, that is, at the mean speed of the moving picture camera film. It will be understood that the film section 19 is covered and screened from the light over the entire section except that part of the film which is opposite the usual picture aperture or window, and that film section 21 is likewise covered or screened by screen 35 except the small part opposite the aperture 36, and that the film in passing across the said screen 35 is held in such close proximity thereto by the feeding mechanism, or otherwise, that the light rays passing through the aperture 36 will act only on the film area limited by the size of said aperture.

Specifically, the sound waves entering the horn 41 from a distant point are concentrated upon the diaphragm of the microphonic transmitter 40, forcibly vibrating the same to vary the resistance of the primary circuit, containing the battery B and the primary coil 43. The latter induces undulating or alternating currents of high tension corresponding in form and frequency with the sound waves impinging upon the diaphragm, in the secondary coil 44, which currents pass across the condenser 45, and become superposed upon the steady current flowing through the lamp 31 from the dynamo or other source 46. The direct current from the source 46, it will be seen, cannot jump across the condenser 45, nor affect the induction coil 43, so that the net result of the variable current impressed upon the lamp 31 by the action of the transmitter 40 will be alternately and rapidly to increase and decrease the intensity of the light in exact accordance with the original sound waves. More particularly, induction coil 43—44 inducing currents flowing alternately in opposite directions through the lamp filament, as the microphone resistance alternately increases and decreases, those currents that flow with the normal lamp current serve to reinforce it and augment the candle power, while those that flow against the normal lamp current oppose it and cause a diminution of the normal luminosity.

The light from the lamp 31 passes into the tube 32 and impinges upon the spherical lens 33, which effectively concentrates or focuses the light upon the screen 35 so that the light passing through the fixed minute aperture 36 will act uniformly over the area of the film exposed by the aperture. The light from the lamp is thus effectively concentrated at any instant upon the relatively minute film areas momentarily exposed. Since, moreover, both the candle power and the actinic effect of the ordinary tungsten or other equivalent lamp operating at rated current consumption, change markedly with small increments or decrements of current, it follows that the degree of exposure of the film will very relatively widely with the relatively minute changes in lamp current, taking place synchronously with and proportionally to the varying amplitudes of sound or air vibration.

In other words, by the use of a small lamp of low power consumption, operating at high incandescence, I produce maximum variations in candle power with the small increments or decrements of current due to the action of the air or sound waves upon the microphone. These variations in candle power are, moreover, intensified with respect to the film by efficiently focusing the light from the lamp at the highly restricted definitely limited momentarily exposed area of the film.

It will be seen that the tungsten lamp operates silently, eliminating the humming due to the rapid expansion and contraction of the heated gas, such as produced in an arc lamp flame.

When developed the translucency of the sound record produced on the film, operated at the speed noted with the momentary exposure limited to the width of the slit or small pin hole opening, changes rapidly from moment to moment, with the density or attenuation of the successive fractions of sound waves, which are recorded seriatim, without objectionable blurring or overlapping. In Fig. 8 is shown on a greatly enlarged scale, the approximate appearance of a small segment of a sound record, which may represent a portion of a single sound wave. The sound record, it is seen, presents a substantially straight band made up of a succession of lights and shadows, in which the alternations of light and shade and the distance between them correspond with and represent the wave length, pitch or frequency of the original sound waves, while the degree of differentiation in translucency between lighter and darker areas corresponds to and represents amplitudes or loudness. The darker and lighter areas of the band will usually merge into one another in a continuous succession in the direction of the length of the film. The translucency at each point on the band representing the momentary amplitude of air vibration, it will be seen that the simplest, as well as the most complex sound waves will be accurately recorded. The picture and voice sections 19 and 21 of the film, are simultaneously exposed at their respective optical centers, as heretofore noted, with the latter somewhat in advance of the former. This apparent displacement will be automatically neutralized, and the voice and picture recorded simultaneously if the time interval between the picture and voice sections substantially equals that for the travel of the sonorous action from a distant source to the receiving horn 41. The length of loop 20 in the camera may be adjusted in accordance with the distance of the stage or other source of sound from the camera.

The receiving horn 41, it will be understood, may be placed nearer the stage than the camera and the voice transmitted from the horn to the camera electrically, in which case, the voice record will, of course, be impressed upon the film, with a lead relative to the corresponding picture.

In reproducing from the positive print of the negative film just described, the voice would be electrically transmitted from the projecting machine to the stage, and there telephonically reconverted into sound, with a lead relative to the corresponding picture, to compensate for the lag of sound relative to light, so that the visible and sonorous reproduction would reach the audience synchronously.

If desired, I may employ in lieu of the incandescent lamp, an arc lamp operated by direct current and burning with a steady light and at approximately constant temperature and luminosity. The variation in the current supply produced by sound vibrations directed upon the microphone connected in substantially the manner shown in the drawings, produces rapid variations in the candle power of the light, according to the singing or speaking arc principle. The arc lamp is preferably enclosed in a sound proof casing, so that the otherwise audible air vibrations set up thereby will not be heard.

It will be seen that whether the incandescent filament or arc lamp is employed, I produce undulatory variations in light intensity or candle power, similar in form to the vibrations of the air accompanying the vocal or other sonorous action, the varying light producing chemically a corresponding sound record upon the film, preferably taken concurrently with a record of the series of pictures of the scene. The film is developed to form a photographic negative and the combined picture and sound record may subsequently be transferred by photo-printing in the usual manner upon any desired number of positive films, from which the action is reproduced by a projection method and machine fully described in my copending parent application, heretofore mentioned.

It may be noted here that in the reproduction of my photographic sound record, the sound is in every respect identical whether it is reproduced from a negative or a positive print that is to say, that whereas in the negative the sound waves appear as light and dark sections or waves, corresponding sections or waves in the positive print will appear as dark and light, respectively, but the effect when projecting a beam of light through the film in either case to reproduce the sound waves recorded thereon will be the same.

In Figs. 4 to 7, I have illustratively shown various typical forms of "phonoscopic" or talking machine films produced by my method. In the embodiment of Fig. 4, the

sound record, indicated by the numeral 50, extends or runs in a vertical direction at one side of the film, a space being reserved for this record between the right-hand sprocket perforations 51 on that side of the film, and the edge portion of the series of pictures 52 nearest thereto.

Fig. 5 shows an extra wide film, such as I prefer to use in taking and reproducing dramatic or operatic performances, on a large scale, in which the entire stage, either with or without its proscenium arch as a frame for the setting may be shown. This film also has an extra wide space 53 for my sound record, produced as with the aperture cap shown in Fig. 2, in order to give it ample capacity for the reception and proper reproduction of the powerful sound vibrations of a large chorus and orchestra.

In Fig. 6 the pictures 54 are shown as running horizontally, and the sound record 55 as extending in a horizontal direction below the same. The purpose of this arrangement is to eliminate, or at least in a large degree to minimize, the objectionable flickering of the ordinary film and the reduction of illumination caused by the use of a shutter, without hampering the recording or reproduction of the sound record.

The film 56 of Fig. 7 is provided with a plurality of sound records, two of these 57 and 58 being here shown as extending along the edges of the film outside of the left and right hand sprocket holes 59 respectively. This embodiment permits the use of the existing standard size of motion-picture films without diminution of the size of the pictures, and also permits the impression of one or more photographic sound records upon those portions of the film not at present utilized for photographic purposes. In the embodiment of Fig. 7, it will be understood that two or more sound records, both related to the picture are simultaneously recorded upon the film for alternate or concurrent reproduction. The method of producing the film or record will be apparent from the following illustrative example.

Let the animated pictures 56 shown in Fig. 7 represent the theme of an "illustrated song" pertaining to the sea, to be reproduced alternatively as desired, either with combined vocal and musical accompaniment, or with musical accompaniment alone. In recording, the vocalist, who in this instance does not appear in the picture, sings into my transmitter, preferably at close range and with the proper piano accompaniment, the verses appropriate to the theme, all of which is impressed to form say the right-hand sound record 58 of the film in the manner apparent from Fig. 1 of the drawings and the previous description. The musical accompaniment only, minus the voice is concurrently impressed on the opposite edge 57 of the film to form the left-hand record, by means of a second separate and independent transmitter and recording light-beam (not shown) similar to that described and shown. This accompaniment may be that of another instrument, as a violin played in a room partitioned off and in sound insulated relation from that occupied by the vocalist or piano, or it may be that of the identical piano which accompanies the vocalist. In the latter case, the second transmitter may be placed within the sound box of the piano, where it will not be affected by the voice of the singer.

Another application is to multiple language demonstration films, in which a single picture is accompanied by a plurality of sound records, explaining the action in various languages. The film is produced in a manner analogous to that just described, the lectures in the various languages being recorded simultaneously with the picture, but independently on different bands of the same film.

Although I have herein shown and described my invention more particularly in connection with kinetoscopic or cinematographic films, I desire it to be understood that many of the features of my method are applicable to the production of one or more photographic records of vocal, musical or other sonorous action, independently of pictures.

My method, as herein disclosed, is not limited to the particular applications thereof, which I have illustrated in the drawings, but is broadly as well as specifically aplicable to numerous other purposes and capable of being carried out in various forms of phonographic, telephonic and other apparatus.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:—

1. The method of recording sound photographically, which consists in moving a body having a surface sensitive to light across the back of a screen having a small aperture, limiting the area of exposure to the area of the aperture, and varying the degree of exposure in accordance with sound waves impressed upon a sound translating device, whereby said sensitized surface when developed will present a continuous line or band having alternating sections of varying degrees of density or translucency throughout its length, the opposite extremes of density indicating the peaks of continuous waves corresponding to the sound waves impressed upon the sound translating device.

2. The method of recording sound photographically, which consists in moving a body having a surface sensitive to light across the back of a screen having a small

aperture which exposes the sensitive material to light in a continuous line or band of uniform width, limiting the area of exposure to the area of the aperture, and varying the intensity of the light in accordance with sound waves impressed upon a sound transmitting device for the purpose of producing corresponding variations in the degree of exposure of said sensitive material as the same is moved across the aperture.

3. The method of recording sound photographically, which consists in moving at a constant speed a body having a surface sensitive to light across the back of a screen having a small aperture which exposes the sensitive material to light in a continuous line or band of uniform width, limiting the area of exposure to the area of the aperture, and varying the intensity of the light in accordance with sound waves impressed upon a sound transmitting device for the purpose of producing corresponding variations in the degree of exposure of said sensitive surface as the same is moved across the aperture.

4. The method of recording sound photographically, which consists in moving a photographic film in the form of a strip or band across the back of a screen having a narrow aperture which exposes the sensitive material to light in a continuous line or band of uniform width throughout the length of the film, limiting the area of exposure to the area of the aperture, and varying the degree of exposure of said line or band in accordance with sound waves impressed upon a sound translating device, whereby said film when developed will present a continuous line or band of uniform width and alternating sections of varying degrees of density or translucency throughout its length, the opposite extremes of density indicating the peaks of continuous waves corresponding to the sound waves impressed upon the sound translating device.

5. The method of recording sound photographically, which consists in moving a photographic film in the form of a strip or band across the back of a screen having a narrow aperture which exposes the sensitive material to light in a continuous line or band of uniform width throughout the length of the film, limiting the area of exposure to the area of the aperture, and varying the intensity of the light by and in accordance with sound waves impressed upon a sound transmitting device for the purpose of producing corresponding variations in the degree of exposure of said sensitive material as the same is moved across the narrow aperture, whereby when the film is developed a record is produced on said photographic film in the form of a continuous line of band of uniform width and varying degrees of density or translucency throughout its length corresponding to the variations in light produced by the sound waves impressed upon the sound transmitting device.

6. The method of recording sound photographically, which consists in moving at a constant speed a photographic film in the form of a strip or band across the back of a screen having a narrow aperture which exposes the sensitive material to light in a continuous line or band of uniform width throughout the length of the film, limiting the area of exposure to the area of the aperture, and varying the intensity of the light by and in accordance with sound waves impressed upon a sound transmitting device for the purpose of producing corresponding variations in the degree of exposure of said sensitive material as the same is moved across the narrow aperture, whereby when the film is developed a record is produced on said photographic film in the form of a continuous line or band of uniform width and having alternating sections of varying degrees of density or translucency throughout its length, the opposite extremes of density indicating the peaks of continuous waves corresponding to the variations in light produced by the sound waves impressed upon the sound transmitting device.

7. The method of recording sonorous action by causing undulatory variations in light intensity, similar in form to the vibrations of the air accompanying the said action, and exposing a photographic film to the influence of the light only through a window aperture of the width of a small pin hole adjacent the film, while moving the film at a speed in the order of one foot per second to effect an imprint thereon lengthwise of the film, differentiated in accordance with the varying amplitudes of sound vibrations and limiting the area of exposure to the area of the aperture.

8. The method of recording sonorous action by causing undulatory variations in light intensity, similar in form to the vibrations of the air accompanying the said action, focusing the light in a pointed pencil toward a fixed point substantially in the plane of a photographic film moving at a rate of speed in the order of one foot per second, and through a window aperture adjacent the film, of substantially the width of a small pin hole and limiting the area of exposure to the area of the aperture.

9. The method of concurrently recording simultaneous visible and sonorous action upon a single photographic film, which consists in focusing the visible action upon the film during intermittent advance thereof at said focusing region, while focusing light directed in a pointed pencil toward a fixed point substantially in the plane of the film

and at a strip thereof laterally of the picture portion and at a region where the film moves at constant speed, and screening the film in the path of the variable light to expose an area limited in width in the direction of the moving film to the width of a small pin hole, said light having undulatory variations in intensity similar in form to the vibrations of the air accompanying the sonorous action.

10. The method of recording sound waves upon a traveling photographic film limited in speed to motion picture requirements, which consists of photographing thereon the denser and more attenuated portions thereof seriatim, the period of photographic exposure being so related to the speed of the film and to the duration of said portions of sound waves as to prevent overlapping or blurring, accomplished by varying the intensity of a beam of light in accordance with the varying amplitudes and phases of said waves, having said beam narrowed by a slit to adjust the period of exposure to the speed of the film and the duration of the parts of sound waves and limiting the area of exposure to the area of the slit.

11. The method of recording sound waves upon a traveling photographic film limited in speed to motion picture requirements, which consists of photographing thereon the denser and more attenuated portions thereof seriatim, the period of photographic exposure being so related to the speed of the film and to the duration of said portions of sound waves as to prevent overlapping or blurring, accomplished by varying the intensity of a beam of light in accordance with the varying amplitudes and phases of said waves, assisted by focusing said beam on said film through a slit to further define the characteristics of the shorter waves and limiting the area of exposure to the area of the slit.

12. The method of recording sound photographically, which consists in moving a photographic film in the form of a strip or band across an aperture plate, limiting the exposed area of the film to the area of the aperture by maintaining the film in close contact with said plate, moving the film at a constant speed across said aperture to expose the sensitive surface to light in a continuous line or band of uniform width, and varying the degree of exposure of said line or band in accordance with sound waves impressed upon a sound translating device, whereby said sensitized surface when developed will present a continuous line or band of uniform width and alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound translating device.

13. The method of recording sound photographically, which consists in moving a photographic film in the form of a strip or band across an aperture plate, limiting the exposed area of the sensitive surface to a space of the order of a thin line by an aperture in said plate whose width is much greater than its length, maintaining the film in close contact with said plate to prevent diffusion of light, moving the film at a constant speed across said aperture to expose the sensitive surface to light in a continuous line or band of uniform width, and varying the degree of exposure of said line or band in accordance with sound waves impressed upon a sound translating device, whereby said sensitized surface when developed will present a continuous line or band of uniform width and alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound translating device.

14. The method of producing motion pictures and photographic sound records concurrently upon the same photographic film, which consists in moving a photographic film through a camera at a speed adapted to produce a given number of pictures per second, simultaneously moving said film at the same rate per second across the back of a screen having a narrow aperture which exposes the sensitized surface to light in a continuous line or band parallel to the line of pictures and of uniform width throughout its length, limiting the area of exposure to the area of the aperture, and varying the degree of exposure of said line or band in accordance with sound waves impressed upon a sound translating device, whereby said sensitive surface when developed will present adjacent to the pictures a continuous line or band of uniform width and having alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound translating device.

15. The method of producing motion pictures and photographic sound records concurrently upon the same photographic film, which consists in moving a photographic film through a camera at a speed adapted to produce a given number of pictures per second, simultaneously moving said film at the same rate per second across the back of a screen having two narrow apertures by which the sensitized surface is exposed to light in two continuous lines or bands parallel to the line of pictures, and each band being of uniform width throughout its length, limiting the areas of exposure of each band to the areas of the respective apertures and varying the degree of exposure of said lines or bands by and in accordance with sound waves impressed upon a sound transmitting device, whereby said sensitized sur-

face when developed will present adjacent to the pictures two bands each of uniform width throughout and having alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound transmitting device.

16. The method of producing motion pictures and photographic sound records concurrently upon the same photographic film, which consists in moving a photographic film through a camera at a speed of approximately one linear foot per second, simultaneously moving said film at the same rate of speed across the back of a screen having a narrow aperture which exposes the sensitized surface to light in a continuous line or band parallel to the line of pictures and of uniform width throughout its length, limiting the area of exposure to the area of the aperture, and varying the intensity of the light by and in accordance with sound waves impressed upon a sound transmitting device for the purpose of producing corresponding variations in the degree of exposure of said sensitized surface as the same is moved across the narrow aperture, whereby said sensitized surface when developed will present adjacent to the pictures a continuous line or band of uniform width and having alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound transmitting device.

17. The method of producing motion pictures and photographic sound records concurrently upon the same photographic film, which consists in intermittently moving a photographic film through a camera at a speed adapted to produce a given number of pictures per second, simultaneously moving said film continuously and uniformly at the same rate per second across the back of a screen having a narrow aperture which exposes the sensitized surface to light in a continuous line or band parallel to the line of pictures and of uniform width throughout its length, limiting the area of exposure to the area of the aperture, and varying the degree of exposure of said line or band in accordance with sound waves impressed upon a sound translating device, whereby said sensitized surface when developed will present adjacent to the pictures a continuous line or band of uniform width and having alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound translating device.

18. The method of producing motion pictures and photographic sound records concurrently upon the same photographic film, which consists in intermittently moving a photographic film through a camera at a speed of approximately one linear foot per second, simultaneously moving said film continuously and uniformly at the same rate of speed across the back of a screen having a narrow aperture which exposes the sensitized surface to light in a continuous line or band parallel to the line of pictures and of uniform width throughout its length, limiting the area of exposure to the area of the aperture, and varying the intensity of the light by and in accordance with sound waves impressed upon a sound transmitting device for the purpose of producing corresponding variations in the degree of exposure of said sensitized surface as the same is moved across the narrow aperture, whereby said sensitized surface when developed will present adjacent to the pictures a continuous line or band of uniform width and having alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound transmitting device.

19. The method of producing motion pictures and photographic sound records concurrently upon the same photographic film, which consists in intermittently moving a photographic film at a speed of approximately one linear foot per second through a camera having a lens for taking a series of pictures in single line sequence representing objects in motion, simultaneously moving said film continuously and uniformly at the same rate of speed across the back of a screen having two narrow apertures by which the sensitized surface is exposed to light in two continuous lines or bands parallel to the line of pictures, and each band being of uniform width throughout its length, limiting the areas of exposure of each band to the areas of the respective apertures, and varying the degree of exposure of said lines or bands by and in accordance with sound waves impressed upon sound transmitting devices, whereby said sensitized surface when developed will present adjacent to the pictures two bands each of uniform width throughout and having alternating sections of varying degrees of density or translucency representing continuous waves corresponding to the sound waves impressed upon the sound transmitting devices.

Signed at New York city, in the county of New York and State of New York, this 5th day of April, 1923.

ELIAS E. RIES.

PLAINTIFF'S EXHIBIT No. 27

I Certify this, including the Drawing forming part thereof, to be a true Copy
22 MAR 1922
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[Second Edition.]

PATENT SPECIFICATION.

Convention Date (Germany): Mar. 3. 1919. 157,433
Application Date (in United Kingdom): Jan. 10. 1921. No. 1360/21.
Complete Accepted: Mar. 9. 1922.

COMPLETE SPECIFICATION.

Apparatus for Synchronous Reproduction of Optical and Acoustic Operations, for the Purposes of Acoustic Kinematography.

We, HANS VOGT, Engineer, of 9, Konigsweg, Berlin-Schoneberg, Dr. JOSEF ENGL, Physician, of 17, Orberstrasse, Grunewald, and JOSEPH MASSOLLE, Engineer, of 60, Cunostrasse, Grunewald, all in Germany, all citizens of the German Republic, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

For the purpose of acoustic kinematography it is, as is well known, necessary to be able both to record and to reproduce the optical and acoustic operations synchronously and the present invention relates to improved apparatus for reproducing optical and acoustic incidents from a previously obtained synchronous record of both. The invention has for its object to provide reproducing means of this description, in which the optical and acoustic operations are reproduced in such a degree of synchronism that acoustic kinematography may be realized in a practical form.

For the reproduction of sound from photographic records of sound vibrations upon a kinematographic film it has been proposed to employ a telephone receiver, electrically connected to a selenium cell, the resistance of which cell alters according to the varying amount of light which reaches it through the variously blackened portions of the moving film.

According to this invention the undistorted reproduction of sound vibrations which have been recorded optically in synchronism with the series of pictures upon a kinematograph film is effected by employing a constant source of light which plays upon a photoelectric cell consisting of a vessel containing a gas under reduced pressure and provided with two electrodes, of which the cathode is an alkali metal preferably so treated as to give it an alkali hydride surface. When electrically coupled to a suitable reproducing telephone, a photoelectric cell of this kind gives a more faithful reproduction of the original sound vibrations than is obtainable when a selenium cell is employed, and, as a further feature of our invention, we may enhance the effect of the photoelectric cell by connecting it in circuit with a condenser excited by undamped high frequency oscillations.

In carrying this invention into practice, in order to reproduce the optically registered acoustic frequencies which appear upon the strip of film in the form of varied degrees of blackening, the said film is acted upon by a constant source of light, the pencil of rays from which is rhythmically varied in its intensity by the blackenings on the passing film and falls upon a photoelectric cell containing a rare gas and having an alkali metal cathode preferably so treated to give it an alkali hydride surface. If the cathode be exposed to light, electrons are emitted under the action of the tension impressed on the electrodes and form a current which flows through the cell. The strength of this current at any given instant is dependent on the strength of the light to which the cathode is exposed at that instant. A suitable method of treating the alkali metal cathode to produce an alkali hydride surface, consists in subjecting the surface of the alkali metal (such as potassium) to the action of a fluorescent discharge in hydrogen (so that, in the case of the example cited, potassium hydride is formed on the treated surface): As examples of rare

[Price 1s.]

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gases suitable for introduction into the cell in a rarefied state may be mentioned, helium, neon or argon. It is clear that the operation of such a cell is maintained only by electrodes and the gas interposed between them: therefore the current variations will follow the fluctuations of light produced by the photographic sound record without any appreciable inertia.

The variations in the resistance of the photoelectric cell may advantageously be utilised to set up current fluctuations in an oscillating circuit, supplied with undamped high frequency oscillations, the condenser of said oscillating circuit being connected in parallel to said cell and the damping of said circuit being influenced by the resistance set up by the cell.

By these means sufficient intensities of sound can be produced even in large spaces.

In the accompanying drawings, which illustrate practical embodiments of the several features of our invention:—

Figure 1 shows part of a film on which both pictures and sound records appear.

Figure 2 is a diagrammatic view showing the manner in which the sound is reproduced.

Figure 3 shows means for coupling the photoelectric cell in an electric oscillating system.

The section of film illustrated in Figure 1 contains both pictures and sound records which have been recorded synchronously by suitable apparatus, which however, does not constitute part of the present invention.

In order to effect synchronous reproduction of the optical and acoustic incidents thus recorded, the film passes through a kinematographic projector (not shown) and through the apparatus (see Figure 2) for the reproduction of the sound records.

The actual operation of reproducing the sound vibrations takes place as follows:—

The source of light *l* uniformly emits a constant beam of light which is projected by the optical system *o* and the slit *s* in the form of a small focal line onto that part of the film which contains the sound records in the form of varied degrees of blackening. By reason of the movements of the film, the quantity of the light which passes through onto the photoelectric cell *z* is varied in the rhythm of the original acoustic frequencies of which the record was taken. Fluctuations of current are produced in the photoelectric cell *z* by the varying quantity of the light which falls upon it and these fluctuations are amplified by a cathode tube intensifier apparatus *v* and thence transmitted to a suitable reproducing telephone *t* which converts the fluctuations of the current into sound again.

In Figure 3 the photoelectric cell *z* is shown connected in parallel with the condenser of a tuned oscillating circuit A^2 which is excited by the circuit A^1 and transmits energy to the reproducer circuit A^3. By reason of the variations in the resistance of the photoelectric cell the damping of the circuit is influenced in the rhythm of the sound waves.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Apparatus for the synchronous reproduction of optical and acoustic operations for the purposes of acoustic kinematography and wherein the varied blackening of a strip of the combined picture and sound record film is used for reproduction of the sound vibrations, characterised by the fact that the said strip is played upon by a constant source of light which acts upon a photoelectric cell consisting of a vessel containing a gas under reduced pressure and provided with two electrodes of which the cathode is an alkali metal preferably so treated as to give it an alkali hydride surface.

2. Apparatus according to Claim 1 characterised by the fact that the photoelectric cell is connected up in parallel to a condenser circuit fed with undamped high frequency oscillations so that electrical fluctuations are produced in rhythm with the photographically recorded sound vibrations.

Dated this 10th day of January, 1921.

HASELTINE, LAKE & Co.,
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Agents for the Applicants.

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157,433 COMPLETE SPECIFICATION

1 SHEET

2nd Edition

Fig. 2.

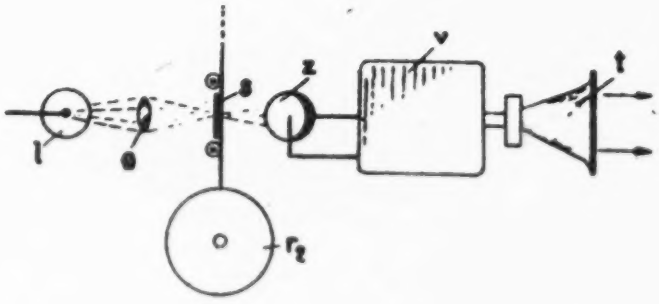


Fig. 3.

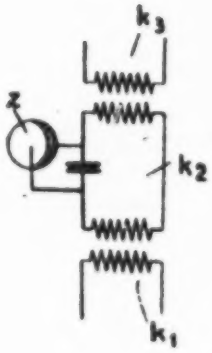
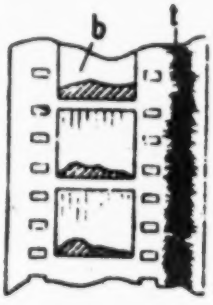


Fig. 1.



[This Drawing is a reproduction of the Original on a reduced scale.]

Charles & Read Ltd. Photo Litho

6.2 Fielder.

PLAINTIFF'S EXHIBIT No. 28

CASE 8

NUMBER (Series of 1915), 704899

1924

1656255

(EX'R'S BOOK) 46-46

DIV. 7

PATENT No. 1656255

Name EDWARD C. WENTE

JAN 17 1928

Assgr. to Western Electric Company, Incorporated, of New York N.Y., a Corp. of New York.

of NEW YORK

State of NEW YORK

Invention TALKING MOTION PICTURE PRODUCTION

Division of App., No. ____ filed ____, 19__

ORIGINAL	RENEWED
APPLICATION FILED COMPLETE APR 8, 1924	
PARTS OF APPLICATION FILED: Petition, Specification, Oath, First Fee, $30, 1 sheets Drawings, APR 8, 1924	43
Examined and passed for Issue June 3, 1927	, 19
Exr. Div. 7	Exr. Div.
Notice of Allowance June 16, 1927 By Commissioner	, 19 By Commissioner.
Final Fee $30 Dec. 16, 1927	, 19
Patented JAN 17 1928	, 19

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J. C. R. Palmer, 463 West St., New York N.Y.

(No. of Claims Allowed 4) Print Claim 2 in O.G. (Cl. 88-16)

Title as Allowed Talking Motion Picture Production

Address

605

UNITED STATES PATENT OFFICE.

PETITION AND POWER OF ATTORNEY

APR 7 1924

Case 8 704,899

TO THE COMMISSIONER OF PATENTS,
Washington, D. C.

2,555

Your petitioner EDWARD C. WENTE,

a citizen of the United States, residing at New York City,

in the County of New York,

and State of New York,

whose post-office address is 554 West 114th Street, New York City, New York, , prays that Letters Patent may be granted to him for the improvement in TALKING MOTION PICTURE PRODUCTION,

, set forth in the annexed specification; and he hereby appoints De Witt C. Tanner (Reg. No. 4325) and John G. Roberts (Reg. No. 9084) of No. 463 West Street, New York, New York, severally, his attorneys, with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

And your petitioner requests that communications from the Patent Office in connection with this application be addressed to the said JOHN G. ROBERTS, 463 WEST STREET, NEW YORK, N. Y.

Edward C. Wente

ASSOCIATE POWER OF ATTORNEY.

Please recognize E. W. ADAMS (Reg. No. 3213) of 463 West Street, New York, New York, as my associate attorney in the above mentioned application, with full power to prosecute said application, to make alterations and amendments therein, to sign the drawings, and to transact all business in the Patent Office connected therewith.

All communications, however, are to be addressed to me as above requested.

John G. Roberts
Attorney for Applicant.

APR - 7 1924

~~TO ALL WHOM IT MAY CONCERN:~~

Be it known that I, EDWARD C. WENTE, a Citizen of the United States of America, residing at New York City, in the County of New York and State of New York, have invented certain new and useful improvements in TALKING MOTION PICTURE PRODUCTION, of which the following is a full, clear, concise and exact description.

This invention relates to the reproduction of variations of energy states, for example the reproduction of changes of scene and concurrent variations of sound as instanced in the making of talking motion pictures.

An object of the invention is to facilitate such reproductions.

A special object is to simply and effectively produce a plurality of records, at least one of which may be positive, of variations of different energy states, on one and the same record bearing medium $\frac{1}{m}$ as, for instance to produce an effective kinetophonic film, or positive motion picture film containing a photographic sound record in proper position to produce synchronism between the pictures and the sounds as reproduced.

For brevity and clearness, the invention is disclosed herein with especial reference to its application in the production of talking motion pictures, though it is not necessarily to be regarded as limited to that art.

It is an object of the invention to increase the upper limit of the sound frequencies which may be recorded on the positive picture film.

A further object is to obtain the desired contrast in the sound record on a positive picture film without unduly limiting the control of contrast in the positive pictures.

Another object is to eliminate objectionable noise due to the granular character of the emulsion on which the original sound record is made.

Another object is to obtain a sound record on a positive picture film and yet permit the camera and the sound recorder employed in making the original sound and picture records to be moved about independently and also permit the same camera to be used without alteration for both talking and silent motion pictures.

Another object is to obtain a sound record on a positive picture film and yet permit deletion of any portion of either the positive or the negative picture record without causing undue discordance between the pictures and sounds as finally reproduced.

A still further object is to photographically print a negative picture record and a sound record onto a homogeneous record medium and yet permit independent control of the exposure of these records during the printing.

In the embodiment of the invention specifically illustrated and described herein, these various objects are attained by recording the pictures and the sounds on two separate negative films, preferably with the sound film running faster than the picture film, and when these negatives have been developed, photographically printing them both on to one and the same film, for instance in a manner described hereinafter.

Further objects of the invention will appear from the following detailed description and claims taken in connection with the accompanying drawings in which:

Fig. 1 represents a sound recorder and a camera for obtaining separate negative film records of concurrently varying sounds and scenes; Fig. 2 is a diagrammatic elevation, partly in section, of one form of apparatus for photographically printing the two negative records on a common film, to form a positive motion picture film carrying the sound record, this figure showing an edge view of the three films in operating relation to the printing apparatus; and Fig. 3 is a fragmentary section through line 3-3 of Fig. 2, looking in the direction of the arrows, with portions omitted, the front or face of the positive film and of the negative picture film appearing in Fig. 3.

In Fig. 1 a sound recorder 10, preferably of the type recording the sound as a series of striae of various exposures, and a motion picture camera 11 are electrically connected as indicated at 9, and are driven synchronously, but preferably with the sound film running at a speed of the order of twice the speed of the picture film, supposing that the sounds to be recorded are speech, for instance. The desired film speed ratio can be obtained, for example, by properly adjusting the relative speeds of the motors (not shown) which drive the films, or by interposing the proper gears or the like (not shown) between the motors and the films. In reproducing changing scenes and sounds by the method involving the present invention, this camera and sound recorder or any other suitable means, are employed to obtain a negative motion picture film 13 (Figs. 2 and 3) and a photographic film 20 (Fig. 2) containing a record of sounds concurrent with the scenes depicted on film 13, the sound film so obtained preferably having been run faster than the picture film during the recording, and preferably having recorded the sound as an exposed band with transverse striature such that after development of the film the band will exhibit striae of various densities after the fashion fancifully indicated at 8 in Fig. 3.

These records after being properly developed and fixed, are photographically printed on a sensitized film 12, for instance as indicated in Figs. 2 and 3 and described hereinafter, with the printed records on film 12 so positioned with respect to each other as to produce synchronism between the pictures and the sounds when the film 12 is later passed through the proper picture projecting and sound reproducing apparatus (not shown), which may be of any suitable type. Where, as usual, the film is moved intermittently in its

projection and the sound record moves continuously during its reproduction, the various portions of the sound record will ordinarily be printed not exactly opposite the corresponding pictures, but relatively displaced an amount approximately equal to the length of film between the portion of the picture being projected at any instant and the portion of the sound record being reproduced at that instant. If this displacement is made sufficiently small, any discordance between the pictures and sounds as finally reproduced, due to deletion of any length of the positive film necessitated for instance by damage to that film, will be substantially unnoticeable. This advantage can be attained by constructing the picture projecting and sound reproducing means so that the length of film between the picture being projected and the sound being reproduced is not greater than about four inches (a limitation easily satisfied) since with such a construction the corresponding time displacement between the pictures and sounds as reproduced is only about a quarter of a second when the positive film with the usual 16 pictures per foot is run at the usual speed of 20 pictures a second. The editing of the film may all be done before a positive print is made, so that cutting out of any portion of the negative need result in none of the discordance which might be created if the sound record and the pictures were made on the same negative.

It is here pointed out that in a talking motion picture system heretofore proposed, in which the picture negatives and the negative sound record are made on one common film from which the picture positives and the positive sound record are printed on another common film, the minimum possible displacement between the picture and sound records on either

film is greater than the minimum length of the positive film which it would be possible (by modification of the picture projector and sound reproducer) to preserve between the place at which the pictures are projected and the place at which the sound is reproduced; for the minimum possible displacement between the records is determined by the minimum possible length of the negative film between the place at which the pictures are recorded and the place at which the sound is recorded, and this length is influenced by the requirements of the construction of the camera and sound recorder, such as the requirement that the camera should be portable and the requirement that the film in the camera be carefully protected at all times against unintentional exposure to light, which have no counterpart in the requirements of the construction of the picture projector and sound reproducer.

In the operation of photographically printing the records carried by films 13 and 20 upon the film 12, the films 12 and 13, in contact with each other, pass downward over sprocket wheels 18 and 18', the film 12 being driven by a sprocket wheel 24 from a gear wheel 33 which derives its motion from a shaft 32 turned by a gear wheel 31 driven from any suitable source of power (not shown) . In their downward travel the films pass an adjustable aperture 15 in a mat, screen or shutter 14. The film 13 is between the film 12 and the mat 14. A source of light 19, illuminating a portion of the film through aperture 15, causes the picture negatives carried by film 13 to be photographically printed on film 12 as positives. However, the mat 14 shields the left hand marginal portion of film 12 from the light source 19, as indicated in Fig. 3, thus reserving that portion of film 12 for the sound record which is to be printed on the film.

In Fig. 3 there is shown at 12a a length of the positive film 12 upon which pictures, fancifully indicated by dotted lines, but no portions of sound record, have been printed. Actually, of course, the picture positives would not be apparent before development of the film 12. By adjusting the shutter opening 15 the amount of light used in printing the negative pictures upon film 12 as positives can be regulated.

The picture positives having been printed on film 12, that film, preferably alone, travels downward over sprocket wheels 23 and 24, passing a slit or narrow aperture 17 in a mat 16. The sound negative 20 passes downward over sprocket wheels 21 and 22, sprocket 22 being driven from the gear 31 by means of a gear 34. In Fig. 2 a source of steady illumination is shown at 25, and an optical system is so arranged that an image of a narrow illuminated line on the negative sound film 20 at point 26 is obtained at point 30, for example by means of the lens 27, a narrow opening at point 28, a lens 29, and a cylindrical lens 29'. The function of lens 29' will be pointed out hereinafter. At the point 30 the narrow line image is photographed or printed upon a portion 12a of the positive film 12. In Fig. 3 there is shown at 12b a length of the positive film 12 upon which both the picture and the sound records have been printed, as fancifully indicated. The gears 31 and 34 preferably drive the sprocket wheel 22 at such speed that the sound negative 20 moves faster than the portion 12a or 12b of the film 12. The relative speeds should here be the same as the relative speeds used for the sound negative and the picture negative in making those records.

Both the sound record and the pictures having been printed on film 12, the film may be developed and the records fixed upon it.

As indicated above, the length of film 12 between apertures 15 and 17 should preferably be not greater than about four inches.

As pointed out above, one of the advantages of taking sound and picture records on separate negatives is that the sound film may, if desired, be run at greater speed than that customary for making picture films. The highest possible film speed for making the sound negative will depend upon the character of the films available. It has been found desirable, especially in the case of sound records involving frequencies of the order of several thousand cycles per second, to make the negative sound record at a film speed twice that used to make the picture negative, when films of the character of Eastman super-speed film are employed to make the negative sound records and film of the character of Eastman positive motion picture film are employed to make the positive records. As indicated above, this two to one ratio in the relative speeds of the negatives may be obtained, for example, by making proper adjustments in the speed of the motors driving the sound recorder and the camera, or by interposing the proper speed changing means between the motors and the negatives. As noted above, the same speed ratio which exists in the running of the sound and picture negatives while they are being made should preferably be maintained when the two negatives are driven for printing on the common positive. This may be done, for example, by making the size of the driving gear of the sprocket wheel 22 half as large as the gear on sprocket wheel 31, as shown in Fig. 2 and indicated in the description above.

One of the chief advantages of making the sound record on a negative running at twice the speed of the motion picture film results from the fact that a photographic emulsion of high sensitivity has inherently a coarse grain structure.

For instance, the Eastman super-speed motion picture film has such a coarse granular structure that its resolution is only about half as great as that of the Eastman positive motion picture film. The upper limit of frequencies that may be recorded will, therefore, be twice as great for the positive as for the negative film for the same linear speed; or in other words, the same range of frequencies may be recorded on the positive at one half the speed of the negative.

For correct sound reproduction it is important that the development of the positive and negative be so carried out that the transmission of the positive is at every point proportional to the exposure of the negative. This is in general not the best condition for the pictures as under these circumstances they will usually be too harsh. In the system here proposed the picture negative and positive can be developed to give the most pleasing results for pictures, and yet the negative of the sound record can be so developed that when it is printed on the picture positive film, the required contrast is obtained in the positive sound record.

In order to get strict proportionality between illumination of the negative and transmission of the printed positive, in addition to proper development it is desirable that the exposure of both positive and negative shall always remain on the straight part of the characteristic curves of the photographic emulsions. Even with high power lenses and an intense source of steady illumination it has been found desirable to use ~~the Eastman~~ a super-speed film for the sound negative in recording speech, for instance, in order to bring the illumination up to the point where the exposure falls on the straight portion of the characteristic curve. Now this ultra speed film has a coarse granular structure. The granular

structure of the film tends to result in an accompanying noise in the reproduction, which is very similar to the scratch of the needle of the ordinary phonograph. A way of reducing this noise is to increase the width of the record; the effect of the individual grains on the light transmission during reproduction will then average out more nearly. The space available for a sound record on the picture film is, however, limited, so that a wide record is ordinarily not feasible. By the use of a printer such as is here described the effect of the grain size in the negative may be eliminated. A wide record may be made on the negative, the print of which on the positive may then be reduced by means of the optical system to the required width. The imprint on the positive of the individual grains in the negative will thereby be greatly reduced. If a cylindrical lens be interposed in the optical system, for instance as indicated at 29', no sharp image of the grains in the negative will be formed and they will not be reprodubed on the positive, whereas, if a contact print were made the coarse grains of the negative would be reproduced on the positive. Since the speed of the positive affects only the speed at which prints can be made, an emulsion of very fine granular structure can be used and scratching noise in the reproduction can thus be reduced to a minimum.

Due to variations in lighting conditions and in the character of the objects being photographed, motion picture negatives may vary greatly in density throughout the length of a single roll of film. It is customary to correct for this by varying the intensity of the light used for making positive records from the negatives. Sound records on negative films, on the other hand, may be produced under more easily controllable conditions, so that usually no such correction is required

or desirable, or if required the correction will be different from that of the corresponding portion of the picture record. In accordance with this invention a separate lighting means is used for the picture and sound records, respectively, during the printing. With this arrangement the exposure of the positive motion picture record can be varied, as for instance by varying the width of the opening 15 in the manner common in the art, or varying the intensity of the light 19 by any known or suitable means (not shown), without correspondingly varying the exposure of the sound record, and if desired the exposure of the sound record can be independently varied. It is of course possible to simultaneously vary the width of the opening 15 and the intensity of the light from source 19, to vary the exposure of the films 13 and 12 to the light from source 19.

The optical system diagrammed in Fig. 2 is a practical one; but the results attained thereby can be achieved in various ways. Similarly, although Figs. 2 and 3 show one practical arrangement for printing the negative pictures on the positive film, it is to be understood that other means, for instance a standard step-by-step printer, might be employed, part of the positive film being masked, however, as in the arrangement shown in Figs. 2 and 3, to leave sufficient space for the sound record. In fact, the principles of the invention claimed may be embodied in many organizations differing from those specifically illustrated and described.

WHAT IS CLAIMED IS:

1. The method of recording concurrent sets of variations of states of energy of different kinds, which comprises producing a record of one set on one record medium, producing a negative record of another of said sets on a separate record medium, reproducing said one record on a record medium, and reproducing said negative record on said medium as a positive record.

2. The method of recording variations of energy states which comprises producing a record of said variations on a surface of relatively low resolution, and reproducing said record on a surface of relatively high resolution.

3. The method which comprises producing a record of variations of energy states on a record surface of relatively low resolution and reproducing said record in reduced size on a record surface of relatively high resolution.

4. The method which comprises reproducing, in reduced width, on a surface of high resolution, a record of variations of energy states which is on a surface of relatively low resolution and is characterized by thin parallel lines traverse of the record.

5. In reproducing concurrent sets of variations of states of energy of different kinds, the method which comprises producing a record of one of said sets on one moving record medium, producing a record of another of said sets on another record medium moving at a speed different from that of said one record medium, and reproducing said two records on a common record medium.

2 Amt A/2

2a 8. In reproducing concurrent sets of variations of energy states, the method which comprises producing a record of one of said sets on one record medium, producing a record of another of said sets on another record medium, and reproducing said two records on a common record medium with the two first mentioned record media moving relatively to each other during such reproduction.

Cancelled per 18

3a 9. In reproducing changing scenes and concurrent sounds, the method which comprises simultaneously producing a negative motion picture film of said scenes and a negative film record of said sounds with said negative sound film moving at a higher speed than said negative picture film, and reproducing said two records on a common record medium with said negative sound film moving faster than said negative picture film.

8. In reproducing concurrent sets of variations of states of energy of different kinds, the method which comprises simultaneously producing a record of one of said sets and a longer record of said other set.

Cancelled per a

9. In reproducing concurrent sets of variations of states of energy of different kinds, the method which comprises simultaneously reproducing records of said sets to different scales.

10. In reproducing concurrent sets of variations of states of energy of different kinds, the method which comprises reproducing records of said sets on a common record medium.

Cancelled per 12

4a 11. The method of printing a positive film record from a plurality of negative records which comprises exposing said positive film to light through said negative records with one of said negative records moving at a speed different from that of another of said negative records.

Grant A3

12. In combination, a light source, means for moving a positive photographic film and a contacting negative motion picture film at constant speed past said light source with said negative between said positive and said source, a second light source, means for moving a photographic sound record film, at greater speed than said negative motion picture film, between said second light source and the moving positive film, and an optical system interposed between said sound record film and said positive film for photographically printing said sound record on said positive film.

der A Cancelled per B

13. In combination, means for reproducing on a record medium a record of a set of variations of states of energy of one kind, and means for reproducing on said record medium a concurrent set of variations of states of another kind of energy.

Cancelled per A

14. In combination, means for photographically printing a sound record from a negative film onto a positive film, and means for photographically printing pictures from a separate negative film onto said positive film.

Cancelled per B

15. In combination, means for simultaneously moving and reproducing on a record medium a record of a set of variations of energy states, and means for moving at a different speed and reproducing on said record medium a record of another set of variations of energy states, while said first movement is in progress.

Cancelled per A

16. In combination, means for reproducing a record of a set of variations of energy states, and means for simultaneously, and to a different scale, reproducing a record of a concurrent set of variations of energy states.

17. In combination, a continuous printer for photographically printing pictures from a negative film onto a positive film, and means for photographically printing a sound record from a separate negative film onto said positive film.

16. In combination, a photographic film containing a negative sound record, a sensitized film on which said negative record is to be reproduced as a positive record, a source of printing light for illuminating a portion of said negative film, means for moving said films relatively to said light source, and means comprising a lens system interposed between said film for subjecting said positive film to light transmitted from said source through said negative film.

19a 19. In combination a sensitized record surface of relatively high resolution, a record including thin parallel lines on a photographic film of relatively low resolution, and a light source and an optical system for printing said record on said record surface, said optical system comprising a cylindrical lens with its axis ~~parallel to one of said parallel lines, for increasing the sharpness of the reproduced record lines as they appear on said record surface.~~ in the plane of said film

Cancelled per Bx

per A

20. A talking motion picture film having thereon pictures forming a record of changing scenes and also having thereon a record of sounds concurrent with said scenes, respectively, the displacement between said pictures of the respective scenes and the corresponding portions of said sound record representing sounds concurrent with the respective scenes being at least as small as four inches, and said pictures being of such length that sixteen occupy at least about a foot of said film.

Cancelled per A

21. In combination, means for producing, on a photographic film, pictures of changing scenes, and means for producing on said film a record of sounds concurrent with said scenes respectively, which has each of its portions within a distance of four inches from the picture corresponding to that portion, measured along the film.

22. The method of printing a positive record film from a plurality of negative records which comprises exposing said positive film to light through said negative records, and separately controlling the light through one of said negative records.

23. The method of printing a record film from a plurality of records at least one of which is a negative record, which comprises independently illuminating said records, and exposing said film to said illumination through said records simultaneously.

24. The method of printing a positive talking motion picture film from a picture negative record and a sound negative record, which comprises exposing the medium on which said first record is to be produced to light through said negatives records, and separately controlling the light through one of said negative records.

25. The method of printing a positive sound and motion picture film from a picture negative and a sound record, which comprises simultaneously exposing said film to light through said negative and through said record, and separately controlling the light through said picture negative.

26. In combination, a positive film, a plurality of negative records, and means for simultaneously printing said negative records on said positive film comprising a

plurality of sources of light, one individual to each of said negative records.

27. In combination, a positive film, a negative motion picture film record, a negative sound record, and means for simultaneously printing said negative records on said positive film, said means comprising two sources of light, one individual to each of said negative records.

28. Means for simultaneously printing positive picture and sound records from a negative picture record and a negative sound record, said means comprising means for independently illuminating said negative records.

29. In combination, a positive film, a negative motion picture film record, a negative sound record, and means for simultaneously printing said negative records on said positive film, said means comprising two light sources individual to said negative records and means whereby the exposure of said picture negative may be varied and said negative sound record simultaneously subject to a constant exposure.

30. In combination, a positive film, a negative motion pictur film record, a negative sound record, and means for simultaneously printing said negative records on said positive film, said means comprising means for varying the relative exposures of said negative records during said printing.

31. A process of forming sound and motion picture records which consists of forming a photographic negative record of a changing scene, forming a photographic negative record of sound accompanying the scene, separately developing said records

and thereafter printing said records on a single positive film.

32. A process of forming sound and motion picture records which consists of forming a photographic negative record of a changing scene, forming a photographic negative record of the sound accompanying the scene, the width of this record being of the order of double the width required for its reproduction on the positive film, separately developing said records and thereafter printing said records on a single positive film with the sound record reduced to the required width.

33. A process of forming sound and motion picture records which consists of forming a photographic negative record of a changing scene, forming a photographic negative record of the sound accompanying the scene, with the speech film running at a speed of the order of twice that of the picture film, and separately printing said records on a single positive film with the negative sound record reduced in width and in length.

BLL:BF

In Witness Whereof, I hereunto subscribe my name
this 1st day of April, A. D. 1924

Edward C. Wente

OATH.

State of NEW YORK
County of NEW YORK } ss.

EDWARD C. WENTE the above named petitioner, being duly sworn, deposes and says that he is a citizen of the United States, and resident of New York City, in the County of New York, and State of New York, and that he verily believes himself to be the original, first, and sole inventor of the improvement in TALKING MOTION PICTURE PRODUCTION, described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof; or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that the said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by him or his legal representatives or assigns in any country foreign to the United States, ~~except as follows~~:

Edward C. Wente

Sworn to and subscribed before me
this 1st day of April, 1924

Notary Public.

[illegible]
Commission Expires March 30th, 1926

625

Div. 7 Room 312 2-280 RFP Paper No. 2

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON October 15, 1924.

PATENT OFFICE, OCT 15 1924 MAILED

John G. Roberts,
463 West St.,
New York, N. Y.

Please find below a communication from the EXAMINER in charge of the application of

E. C. Wente, TALKING MOTION PICTURE PRODUCTION,
April 8, 1924, 704,899.

Thomas E. Robertson
Commissioner of Patents.

Page 4 lines 19-21, the examiner queries the statement that striae will be formed. The film moves continuously while the sound waves fluctuate and therefore the image would blur or carry over and give no thin or threadlike line or lines.

Page 5, lines 14-16, and page 8 lines 1-3, it is not believed to be possible to bring the sound record and picture record within four inches of each other longitudinally of the film. From the statement of lines 17-19 it would seem that the intention was to have the selenium cell and picture projector side by side as this would be the only obvious way to displace the time of production; but this would render the device inoperative as the sound record must travel continuously while the picture record moves step by step. Therefore the selenium cell and picture projector could not be in the same plane transverse of the film. Further, four inches of the film means five pictures, a loop must be maintained to adjust for the intermittent travel necessary in picture production, guide and driving sprockets

are necessary and it is therefore not seen how room within four inches is left for two simultaneous exposures.

Page 7, lines 14 and 15, the types of film should be defined by the characteristics of the film as supplemental to the trade name. The composition might easily be varied over a period of years. Line 15, "film" should be -films-.

Page 10, lines 13-18, when the imprint of the wide record is reduced, the imprint of the grains will be reduced proportionally. It is not understood how a proportionate reduction will change the relation between the grain structure and the sound record. The statement that the use of a cylindrical lens will eradicate the evidence of grain structure upon the positive is thought to be erroneous.

Claims 1, 10, 13, 14, 17, 21, 23, 26-28, and 31 are rejected on;

Greensfelder, 1,254,884, Jan. 29, 1918, 88-16.2

Note Figs. 5 and 6 and page 3, line 128 to page 4, line 8 and page 5, line 128-to-page 6 line 4. Here the negatives are taken separately and reproduced on the same positive film.

Claims 2 to 4 are rejected on;

Brown et al. 1,034,192, July 30, 1912, 95-5

See page 1 lines 87-109.

Claims 5 to 7 and 11 are rejected on Greensfelder cited, in view of;

Tigerstadt, 100,748, Mar. 20, 1919, (British, 1 sheet) 88-16.2

To follow the teaching of Tigerstadt page 1 lines 14 to 19

in the production and reproduction as accomplished by Greensfelder would not be invention.

The sound record being longer than the picture record, in order that both may be reproduced within the length of the shorter record, it is obvious that the longer must travel faster than the shorter, and no invention is involved.

Claims 4 and 19 are objected to, see comment on lines 19-21 of page 4.

Claim 6 is further rejected as vague. It is not included whether the record media move relatively to each other during production or reproduction.

Claims 8, 9 and 16 are rejected on Nigerstadt, cited above. The application is obvious.

Claims 9 and 16 are further rejected as vague and confusing in the use of the term "different scales". This would seem to mean either one unit for measuring pictures and a different kind of unit for measuring sound since sound and picture do not have a common basis or else different linear scales along the film as to the amount of room each record occupies.

Claims 10, 13, 14, 17, and 21 are further rejected on;

Vogt, 178,442, Nov. 16, 1922,
(no drawing) page 1 lines 72-74
(British,) 88-16.2

Claims 12 and 15 are rejected on;

Dyer et al. 970,614, Sept.20, 1910,
95-75

in view of;

Jobke, 1,344,896, June 29, 1920,
88-24 Continuous Copy.

Dyer shows a device for printing two negatives upon the

same positive. To use the means of Jobke for printing the second negative in which the negative move faster than the positive would not require invention.

Claim 18 is further rejected as indefinite, line 6, "at greater speed" than what?.

Claim 18 is rejected on Jobke cited above, or;

Hochstetter, 1,325,198, Dec. 16, 1919, 88-24 C. C.

The application is obvious.

Claim 19 is rejected on Hochstetter in view of Brown et al. both cited. To use the fast and slow films of Brown et al. in the device of Hochstetter would not be more than substitution.

Claim 19 is further rejected as inaccurate. The axis of the lens is not parallel to the film as stated in line 6.

Claim 19 is further rejected as based on matter not shown or described. No mention is made in the specification concerning sharpness of the image.

Claims 20 and 21 are rejected on;

Bullis, 1,335,651, Mar. 30, 1920, 88-16.2

Applicant has merely made a change in degree without obtaining any new result.

Claims 20 and 21 are further rejected as inoperative, see comment to lines 14 to 16 page 5 and lines 1 to 3 page 8.

Claims 23, 24, 25, 29 and 30 are rejected on Greensfelder cited in view of either;

Holst, 1,205,632, Nov. 21, 1916, 95-75

or

Tessier, 1,208,582, Nov.21, 1916, 95-75

The use of the device of Holst or of Tessier in reproducing the negatives of Greensfelder would only require mechanical skill. No invention would be involved, for Holst and Tessier show a light which has the intensity varied during the film printing and Greensfelder shows film printing of concurrent energy states.

Claim 32 is rejected on Greensfelder in view of Jobke both cited above. This reduction of continuous strip pictures is taught by Jobke and to reduce one of the records of Greensfelder would not be patentable thereover.

Claim 33 is rejected on Greensfelder in view of; Tigerstadt and Jobke all cited above. Modifying the idea of Greensfelder as broadly as stated in the claim when it is old to run the sound record more rapidly than the picture strip and also old to reduce the size of a record by relatively moving positive and negative does not patentably define over the art.

Examiner, Division 7.

Amendment a

Case 8 # 3

OCT 7 1925

UNITED STATES PATENT OFFICE.

Division 7 Room 312

U. S. Patent Office
OCT 8 1925
DIVISION VII

In re application of

EDWARD C. WENTE

Subject: TALKING MOTION PICTURE PRODUCTION.

Serial No. 704,899

Filed April 8, 1924

THE COMMISSIONER OF PATENTS,
Washington, D. C.

Sir:

In response to the Office action of October 16, 1924, please amend as follows:

Page 3, line 16, erase "to";
line 29, change "5-5" to --3-3--.

Page 7, line 13, change "3" to --2--.

Page 8, line 7, erase "best" and insert --highest--;
line 8, erase "for" and insert --possible in--;
erase the subject matter beginning with "It has", line 9, and ending with "records", line 16 and substitute --In general, it is necessary to employ a high speed film for this purpose in order to obtain sufficient exposure. With the type of high speed films at present available, it has been found desirable, particularly when recording sound involving frequencies of the order of several thousand cycles per second,

a'

to make the negative sound record at a film speed twice that commonly used in making the picture negative.

line 28, change "3" to --2--.

Page 9, line 27, erase "the Eastman" and insert --a--.

Cancel claims 1 to 5, inclusive; 8 to 10, inclusive; 13 and 14; 16 to 18, inclusive; and 20 to 33, inclusive.

Claim 6, line 7, after "other" insert --during such reproduction--.

Claim 12, line 6, after "speed" insert --than said negative motion picture film--.

Claim 19, line 6, erase "parallel" and insert --in the plane of said film.--;

erase lines 7 to 9, inclusive.

Insert claim 1 as follows:

--1. The method of printing a record film from a plurality of records at least one of which is a negative record, which comprises independently illuminating said records, and simultaneously exposing different longitudinal portions of said film to said illumination through said records.--.

Cancelled per [illegible]

Renumber claims 6, 7 and 11 as claims 2, 3 and 4, respectively.

Insert claims 5 and 6 as follows:

5. A process of forming sound and motion picture records which consists of forming a photographic negative record of a changing scene, forming a photographic negative record

of the sound accompanying the scene, with the sound negative running at a speed of the order of twice that of the picture negative, and simultaneously printing said records on a single positive film with the sound negative running at a speed of the order of twice that of the picture negative.

add B'

Cls 2-4

a 3

~~6. In combination, a positive film, a negative motion picture film record, a negative sound record, and means for simultaneously printing said negative records on different longitudinal portions of said positive film, said means comprising two sources of light, one individual to each of said negative records.--.~~

Cancelled per B

Renumber claims 12, 15 and 19 as claims 7, 8 and 9, respectively.

R E M A R K S

Typographical errors and other informalities throughout the specification have been corrected.

As to the Examiner's query in the first paragraph of the Office action, it is well known that sound may be recorded in the form of transverse striations without blurring the image. The trace produced upon the film in this manner is of uniform width, but the optical density varies from point to point in accordance with the instantaneous pressure or rarefaction in the sound waves. Incidentally, Bullis patent 1,535,651, cited by the Examiner, discloses this method of recording sound (see particularly Figs. 2, 9 and 11; and page 4, lines 71-86).

According to the second paragraph of the Office action, the Examiner appears to be confused as to the manner in which applicant's completed film may be employed in a projectoscope. The picture projecting and sound reproducing apparatus,

of course, form no part of applicant's present invention, and therefore have not been described in detail. Nothing can be found in the statement on page 5, lines 17 to 19 of the specification, which would indicate that a selenium cell and picture projector must be mounted side by side in the projectoscope, such a procedure being obviously impossible. Applicant's completed film might be projected by means of the apparatus shown in Fig. 6 of the cited Greensfelder patent 1,254,684. From a consideration of this apparatus it would seem obviously possible to provide room within about four inches for two simultaneous exposures, although in applicant's invention the distance between the corresponding pictures and sound records need not be exactly four inches.

The reference on page 8 of the specification to "Eastman super-speed films" has been canceled since the particular type of high speed film employed is immaterial. The only important point in this connection is that a suitable high speed film must be employed in order to obtain a sufficient exposure when the film is run at a speed sufficient to record the upper range of speech frequencies without blurring. The reference to Eastman films in the first paragraph on page 9, however, has been retained merely to illustrate the different characteristics of typical positive films and super-speed films at present available.

In connection with page 10, lines 13 to 18 of the specification, the statement that the use of a cylindrical lens will eradicate the evidence of grain structure upon the positive film is entirely correct. The use of a cylindrical lens to get a focus in only one direction is well known, but, so far as applicant is aware, has never been employed in the production of sound records as disclosed and claimed in this application. Since a focus is obtained in only one direction by the use of a cylindrical lens, the imprint of the individual

grains in the negative will be distributed fairly evenly over the positive film, thus obliterating all evidence of grain structure.

The rejected claims, with the exception of claims 6, 7, 11, 12, 15 and 19, have been canceled. Of the claims which have been retained, claims 6, 12 and 19 have been amended to more clearly define the invention.

The claims as now presented are drawn to a novel and patentable arrangement for improving the quality of talking motion picture films, and for increasing the upper limit of the sound frequencies which may be recorded thereon.

It is pointed out in the specification that the higher speech frequencies may be more accurately recorded by running the sound negative at a greater speed than that ordinarily employed in motion picture production, for otherwise the transverse striations produced upon the sound negative might blur. Applicant therefore makes the speech and picture records separately in order to secure the best results in the individual records. It may be noted here, however, that this problem is not presented in the recording system of Greensfelder patent No. 1,254,684, since Greensfelder does not produce an oscillograph record of sound waves. This point is important because it has a bearing upon Greensfelder's method of printing the records on the common positive film which, as will be pointed out below, is essentially different from that of applicant.

Applicant's invention consists, briefly, in the novel manner in which the completed sound and picture records are printed on a single positive film. This includes printing the sound record upon the positive film in such a way that it will be relatively displaced an amount approximately equal to the length of film between the portion of the picture being projected at any instant and the portion of the sound record being reproduced at that instant.

Claims 1 and 6 have been drawn along the lines of original claims 23 and 27, which were rejected on Greensfelder, and are now believed to be clearly patentable over Greensfelder in specifying that different longitudinal portions of the positive film are simultaneously exposed to independent illumination through the negative records. It is pointed out beginning on page 5, line 128 of the Greensfelder patent, that the two negatives are placed side by side in printing the common positive.

Claims 2, 3 and 4 comprise original claim 6 as amended, and original claims 7 and 11, respectively. These claims are believed to be clearly patentable over the cited references, taken singly or collectively. It is difficult to understand how the methods of Greensfelder and Tigerstedt could be combined to produce a common positive film in the manner claimed by applicant without the exercise of invention. As far as producing a common positive film is concerned, Greensfelder merely prints the two records side by side in a manner well understood in photography, while Tigerstedt discloses no means whatever for producing a common positive. Claim 5, which has been drawn somewhat along the lines of original claim 33, is also believed to be clearly patentable over the cited art in that it specifies simultaneously printing the sound and picture records on a single positive film with the negative sound record running at a speed about twice that of the negative picture record.

Claims 7 and 8 comprise original claims 12 and 15, the former having been amended to overcome the Examiner's objection to its indefinite form. These claims also distinguish from the cited art, including the Dyer and Jebke patents, in that they call for running the sound and picture negatives at different speeds during the reproducing operation. Furthermore, the Examiner's statement that Dyer shows a device for printing

two negatives upon the same positive appears to be erroneous as Dyer simply prints different portions of the negative b upon the positive film a.

Claim 9, formerly claim 19, has been amended to overcome the inaccuracies pointed out by the Examiner. The advantages of employing an optical system including a cylindrical lens, as specified in this claim, have been pointed out above. The use of a cylindrical lens in this connection is not disclosed in any of the cited patents.

It is believed that this application has been placed in condition for allowance.

Respectfully,

EDWARD C. [illegible]

By [signature]
Attorney

463 West Street
New York, N. Y. OCT - 6 1925

DM:EM

6337

Div. 7 Room 106 WCF-AH Paper No. 4.

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

All communications regarding this application should give the serial number, date of filing, and name of the applicant

Please find below a communication from the EXAMINER in charge of this application

Thomas E. Robertson
Commissioner of Patents

January 7, 1926.

Applicant: E.C.Wente.

John O. Roberts
463 West St.,
New York City.

Ser. No. 704,899.
Filed Apr. 8, 1924.
For Talking Motion Picture Production.

MAILED
JAN 7 1926.

The amendment filed October 7, 1925 is of record.

Additional reference made of record:

ULYSSE, 1,161,210, Nov. 30, 1915. (88-24 C.C.).

Claims 1, 4, 6, and 8 are rejected as not patentably distinguishing from the above patent. As indefinitely as stated, it is immaterial whether series 1, 2, 3, etc., and I, II, III, etc., are on the same negative or different negatives. Merely causing the negatives to travel at different speeds would not involve invention and, as indefinitely as claimed, no useful result would necessarily follow. Unless the relative speed maintained between the negatives in the course of recording thereon was maintained in printing said records on a positive film synchronization between sound and picture would not result and no useful purpose would be served. The claims should define such relation.

Claims 2, 3, 4, 7, 8, and 9 are rejected as not defining invention for reasons stated above. In claim 9, line 6, appears inaccurate as the "axis of the lens" is not "in the plane of the film". Use of a cylindrical lens as claimed is not considered patentable in view of Bullis, 1,335,651, of record, who shows an analogous use of such a lens designated by numeral 22.

Claim 5 is allowed.

Claims drawn to projection printing are classifiable under 88-24 (projecting apparatus), while claims for synchronization of sound and picture records are classifiable under 88-16.2 (motion picture apparatus combined with sound producers). The claims in the case are drawn to divisible subject matter. Division is not required at this time as the claims drawn to the printing are not considered patentable.

Examiner.

PAPER NO. 6
AMENDMENT B

DEC 31 1926

UNITED STATES PATENT OFFICE.

Division 7 Room 106

U. S. PATENT OFFICE
JAN 3 1927
DIVISION VII

In re application of

EDWARD C. WENTE

Case 8

Serial No. 704,899

Filed Apr. 8, 1924

Subject: TALKING MOTION PICTURE PRODUCTION

THE COMMISSIONER OF PATENTS,
Washington, D. C.

Sir:

In response to the Office action of January 7, 1926, please amend the above entitled application as follows:

Erase claims 1, 2, 3, 4, 6, 7, 8 and 9 and renumber allowed claim 5 as claim 1.

Insert the following new claims, numbered 2, 3 and 4:

2. The method of producing a combined sound and moving picture record on the same film, which consists in forming a photographic negative of the changing scene, forming a photographic negative record of the sound accompanying the scene with the sound record running at a greater speed than the picture negative, and simultaneously printing the two records on a single positive film while maintaining the same relative speeds of the two negatives as in recording.

3. The method of producing a combined sound and moving picture record on the same film, which consists in forming a photographic negative of the changing scene, forming a photographic negative record of the sound accompanying the scene on a high speed negative film run at about double the

(6339)

speed of the negative of the changing scene and simultaneously printing the two negative records on different portions of a positive film while running the two negatives at the same relative speed as in recording.

4. The method of producing a synchronized sound and moving picture record on the same film, which consists in forming a photographic negative of the changing scene, simultaneously forming a photographic negative of the sound accompanying the scene on a negative film run at approximately double the speed of the picture negative and simultaneously printing the two negatives on a positive film, the picture by contact and the sound through an optical system while maintaining the same relative speed of the negative as in recording.

Sig

REMARKS

The rejected claims have been canceled and new claims 2, 3, and 4 drawn along the lines of allowed claim 5 have been inserted.

These new claims point out steps in the production of a combined sound and moving picture record on the same film which are believed to be novel with this applicant and a favorable action upon the case as amended is requested.

Respectfully,

EDWARD C. WHITE

By Joel R. Palmer
Attorney

463 West Street
New York, N.Y., DEC 30 1926

GMC:MJ

Jan. 17, 1928. 1,656,255

E. C. WENTE

TALKING MOTION PICTURE PRODUCTION

Filed April 8, 1924

Fig. 1

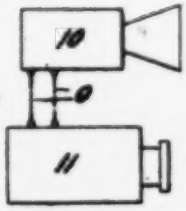


Fig. 3

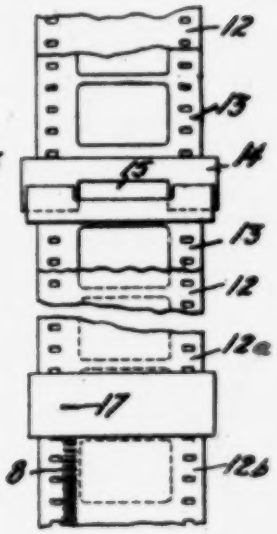
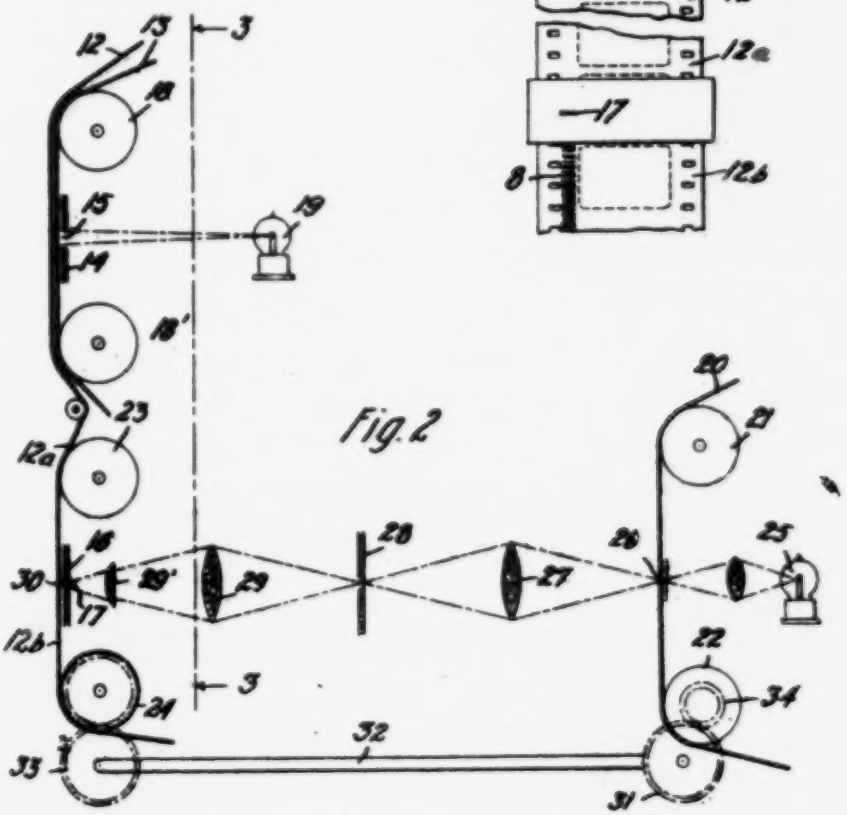


Fig. 2



Inventor:
Edward C. Wente
by Atty

Patented Jan. 17, 1928. 1,656,255

UNITED STATES PATENT OFFICE.

EDWARD C. WENTE, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TALKING-MOTION-PICTURE PRODUCTION.

Application filed April 8, 1924. Serial No. 704,899.

This invention relates to the reproduction of variations of energy states, for example the reproduction of changes of scene and concurrent variations of sound as instanced in the making of talking motion pictures.

An object of the invention is to facilitate such reproductions.

A special object is to simply and effectively produce a plurality of records, at least one of which may be positive, of variations of different energy states, on one and the same record bearing medium—as, for instance to produce an effective kinetophonic film, or positive motion picture film containing a photographic sound record in proper position to produce synchronism between the pictures and the sounds as reproduced.

For brevity and clearness, the invention is disclosed herein with especial reference to its application in the production of talking motion pictures, though it is not necessarily to be regarded as limited to that art.

It is an object of the invention to increase the upper limit of the sound frequencies which may be recorded on the positive picture film.

A further object is to obtain the desired contrast in the sound record on a positive picture film without unduly limiting the control of contrast in the positive pictures.

Another object is to eliminate objectionable noise due to the granular character of the emulsion on which the original sound record is made.

Another object is to obtain a sound record on a positive picture film and yet permit the camera and the sound recorder employed in making the original sound and picture records to be moved about independently and also permit the same camera to be used without alteration for both talking and silent motion pictures.

Another object is to obtain a sound record on a positive picture film and yet permit deletion of any portion of either the positive or the negative picture record without causing undue discordance between the pictures and sounds as finally reproduced.

A still further object is to photographically print a negative picture record and a sound record onto a homogeneous record medium and yet permit independent control of the exposure of these records during the printing.

In the embodiment of the invention specifically illustrated and described herein, these various objects are attained by recording the pictures and the sounds on two separate negative films, preferably with the sound film running faster than the picture film, and when these negatives have been developed, photographically printing them both on one and the same film, for instance in a manner described hereinafter.

Further objects of the invention will appear from the following detailed description and claims taken in connection with the accompanying drawings in which:

Fig. 1 represents a sound recorder and a camera for obtaining separate negative film records of concurrently varying sounds and scenes; Fig. 2 is a diagrammatic elevation, partly in section, of one form of apparatus for photographically printing the two negative records on a common film, to form a positive motion picture film carrying the sound record, this figure showing an edge view of the three films in operating relation to the printing apparatus; and Fig. 3 is a fragmentary section through line 3—3 of Fig. 2, looking in the direction of the arrows, with portions omitted, the front or face of the positive film and of the negative picture film appearing in Fig. 3.

In Fig. 1 a sound recorder 10, preferably of the type recording the sound as a series of striæ of various exposures, and a motion picture camera 11 are electrically connected as indicated at 9, and are driven synchronously, but preferably with the sound film running at a speed of the order of twice the speed of the picture film, supposing that the sounds to be recorded are speech, for instance. The desired film speed ratio can be obtained, for example, by properly adjusting the relative speeds of the motors (not shown) which drive the films, or by interposing the proper gears or the like (not shown) between the motors and the films. In reproducing changing scenes and sounds by the method involving the present invention, this camera and sound recorder or any other suitable means, are employed to obtain a negative motion picture film 13 (Figs. 2 and 3) and a phonographic film 20 (Fig. 2) containing a record of sounds concurrent with the scenes depicted on film 13, the sound film so obtained preferably having been run faster than the picture

film during the recording, and preferably having recorded the sound as an exposed band with transverse striature such that after development of the film the band will exhibit striæ of various densities after the fashion fancifully indicated at 8 in Fig. 3.

These records after being properly developed and fixed, are photographically printed on a sensitized film 12, for instance as indicated in Figs. 2 and 3 and described hereinafter, with the printed records on film 12 so positioned with respect to each other as to produce synchronism between the pictures and the sounds when the film 12 is later passed through the proper picture projecting and sound reproducing apparatus (not shown), which may be of any suitable type. Where, as usual, the film is moved intermittently in its projection and the sound record moves continuously during its reproduction, the various portions of the sound record will ordinarily be printed not exactly opposite the corresponding pictures, but relatively displaced an amount approximately equal to the length of film between the portion of the picture being projected at any instant and the portion of the sound record being reproduced at that instant. If this displacement is made sufficiently small, any discordance between the pictures and sounds as finally reproduced, due to deletion of any length of the positive film necessitated for instance by damage to that film, will be substantially unnoticeable. This advantage can be attained by constructing the picture projecting and sound reproducing means so that the length of film between the picture being projected and the sound being reproduced is not greater than about four inches (a limitation easily satisfied) since with such a construction in the corresponding time displacement between the pictures and sounds as reproduced is only about a quarter of a second when the positive film with the usual 16 pictures per foot is run at the usual speed of 20 pictures a second. The editing of the film may all be done before a positive print is made, so that cutting out of any portion of the negative need result in none of the discordance which might be created if the sound record and the pictures were made on the same negative.

It is here pointed out that in a talking motion picture system heretofore proposed, in which the picture negatives and the negative sound record are made on one common film from which the picture positives and the positive sound record are printed on another common film, the minimum possible displacement between the picture and sound records on either film is greater than the minimum length of the positive film which it would be possible (by modification of the picture projector and sound reproducer) to preserve between the place at which the pictures are projected and the place at which the sound is reproduced; for the minimum possible displacement between the records is determined by the minimum possible length of the negative film between the place at which the pictures are recorded and the place at which the sound is recorded, and this length is influenced by the requirements of the construction of the camera and sound recorder, such as the requirement that the camera should be portable and the requirement that the film in the camera be carefully protected at all times against unintentional exposure to light, which have no counterpart in the requirements of the construction of the picture projector and sound reproducer.

In the operation of photographically printing the records carried by films 13 and 20 upon the film 12, the films 12 and 13, in contact with each other, pass downward over sprocket wheels 18 and 18′, the film 12 being driven by a sprocket wheel 24 from a gear wheel 33 which derives its motion from a shaft 32 turned by a gear wheel 31 driven from any suitable source of power (not shown). In their downward travel the films pass an adjustable aperture 15 in a mat, screen or shutter 14. The film 13 is between the film 12 and the mat 14. A source of light 19, illuminating a portion of the film through aperture 15, causes the picture negatives carried by film 13 to be photographically printed on film 12 as positives. However, the mat 14 shields the left hand marginal portion of film 12 from the light source 19, as indicated in Fig. 3, thus reserving that portion of film 12 for the sound record which is to be printed on the film.

In Fig. 3 there is shown at 12ª a length of the positive film 12 upon which pictures, fancifully indicated by dotted lines, but no portions of sound record, have been printed. Actually, of course, the picture positives would not be apparent before development of the film 12. By adjusting the shutter opening 15 the amount of light used in printing the negative pictures upon film 12 as positives can be regulated.

The picture positives having been printed on film 12, that film, preferably alone, travels downward over sprocket wheels 23 and 24, passing a slit or narrow aperture 17 in a mat 16. The sound negative 20 passes downward over sprocket wheels 21 and 22, sprocket 22 being driven from the gear 31 by means of a gear 34. In Fig. 2 a source of steady illumination is shown at 25, and an optical system is so arranged that an image of a narrow illuminated line on the negative sound film 20 at point 26 is obtained at point 30, for example by means of the lens 27, a narrow opening at point 28, a lens 29, and a cylindrical lens 29′. The function of lens 29′ will be pointed out hereinafter. At the point 30 the narrow line

image is photographed or printed upon a portion 12ª of the positive film 12. In Fig. 3 there is shown at 12ª a length of the positive film 12 upon which both the picture and the sound records have been printed, as fancifully indicated. The gears 31 and 34 preferably drive the sprocket wheel 22 at such speed that the sound negative 20 moves faster than the portion 12ª or 12ª of the film 12. The relative speeds should here be the same as the relative speeds used for the sound negative and the picture negative in making those records.

Both the sound record and the pictures having been printed on film 12, the film may be developed and the records fixed upon it.

As indicated above, the length of film 12 between apertures 15 and 17 should preferably be not greater than about four inches.

As pointed out above, one of the advantages of taking sound and picture records on separate negatives is that the sound film may, if desired, be run at greater speed than that customary for making picture films. The highest film speed possible in making the sound negative will depend upon the character of the films available. In general, it is necessary to employ a high speed film for this purpose in order to obtain sufficient exposure. With the type of high speed films at present available, it has been found desirable, particularly when recording sound involving frequencies of the order of several thousand cycles per second, to make the negative sound record at a film speed twice that commonly used in making the picture negative. As indicated above, this two to one ratio in the relative speeds of the negatives may be obtained, for example, by making proper adjustments in the speed of the motors driving the sound recorder and the camera, or by interposing the proper speed changing means between the motors and the negatives. As noted above, the same speed ratio which exists in the running of the sound and picture negatives while they are being made should preferably be maintained when the two negatives are driven for printing on the common positive. This may be done, for example, by making the size of the driving gear of the sprocket wheel 22 half as large as the gear on sprocket wheel 31, as shown in Fig. 2 and indicated in the description above.

One of the chief advantages of making the sound record on a negative running at twice the speed of the motion picture film results from the fact that a photographic emulsion of high sensitivity has inherently a coarse grain structure. For instance, the Eastman super-speed motion picture film has such a coarse granular structure that its resolution is only about half as great as that of the Eastman positive motion picture film. The upper limit of frequencies that may be recorded will, therefore, be twice as great for the positive as for the negative film for the same linear speed; or in other words, the same range of frequencies may be recorded on the positive at one half the speed of the negative.

For correct sound reproduction it is important that the development of the positive and negative be so carried out that the transmission of the positive is at every point proportional to the exposure of the negative. This is in general not the best condition for the pictures as under these circumstances they will usually be too harsh. In the system here proposed the picture negative and positive can be developed to give the most pleasing results for pictures, and yet the negative of the sound record can be so developed that when it is printed on the picture positive film, the required contrast is obtained in the positive sound record.

In order to get strict proportionality between illumination of the negative and transmission of the printed positive, in addition to proper development it is desirable that the exposure of both positive and negative shall always remain on the straight part of the characteristic curves of the photographic emulsions. Even with high power lenses and an intense source of steady illumination it has been found desirable to use a super-speed film for the sound negative in recording speech, for instance, in order to bring the illumination up to the point where the exposure falls on the straight portion of the characteristic curve. Now this ultra speed film has a coarse granular structure. The granular structure of the film tends to result in an accompanying noise in the reproduction, which is very similar to the scratch of the needle of the ordinary phonograph. A way of reducing this noise is to increase the width of the record; the effect of the individual grains on the light transmission during reproduction will then average out more nearly. The space available for a sound record on the picture film is, however, limited, so that a wide record is ordinarily not feasible. By the use of a printer such as is here described the effect of the grain size in the negative may be eliminated. A wide record may be made on the negative, the print of which on the positive may then be reduced by means of the optical system to the required width. The imprint on the positive of the individual grains in the negative will thereby be greatly reduced. If a cylindrical lens be interposed in the optical system, for instance as indicated at 29', no sharp image of the grains in the negative will be formed and they will not be reproduced on the positive, whereas, if a contact print were made the coarse grains of the negative would be reproduced on the positive. Since the speed of the positive affects only the speed at which prints

can be made, an emulsion of very fine granular structure can be used and scratching noise in the reproduction can thus be reduced to a minimum.

Due to variations in lighting conditions and in the character of the objects being photographed, motion picture negatives may vary greatly in density throughout the length of a single roll of film. It is customary to correct for this by varying the intensity of the light used for making positive records from the negatives. Sound records on negative films, on the other hand, may be produced under more easily controllable conditions, so that usually no such correction is required or desirable, or if required the correction will be different from that of the corresponding portion of the picture record. In accordance with this invention a separate lighting means is used for the picture and sound records, respectively, during the printing. With this arrangement the exposure of the positive motion picture record can be varied, as for instance by varying the width of the opening 15 in the manner common in the art, or varying the intensity of the light 19 by any known or suitable means (not shown), without correspondingly varying the exposure of the sound record, and if desired the exposure of the sound record can be independently varied. It is of course possible to simultaneously vary the width of the opening 15 and the intensity of the light from source 19, to vary the exposure of the films 13 and 12 to the light from source 19.

The optical system diagrammed in Fig. 2 is a practical one; but the results attained thereby can be achieved in various ways. Similarly, although Figs. 2 and 3 show one practical arrangement for printing the negative pictures on the positive film, it is to be understood that other means, for instance a standard step-by-step printer, might be employed, part of the positive film being masked, however, as in the arrangement shown in Figs. 2 and 3, to leave sufficient space for the sound record. In fact, the principles of the invention claimed may be embodied in many organizations differing from those specifically illustrated and described.

What is claimed is:

1. A process of forming sound and motion pisture records which consists of forming a photographic negative record of a changing scene, forming a photographic negative record of the sound accompanying the scene, with the sound negative running at a speed of the order of twice that of the picture negative, and simultaneously printing said records on a single positive film with the sound negative running at a speed of the order of twice that of the picture negative.

2. The method of producing a combined sound and moving picture record on the same film, which consists in forming a photographic negative of the changing scene, forming a photographic negative record of the sound accompanying the scene with the sound record running at a greater speed than the picture negative, and simultaneously printing the two records on a single positive film while maintaining the same relative speeds of the two negatives as in recording.

3. The method of producing a combined sound and moving picture record on the same film, which consists in forming a photographic negative of the changing scene, forming a photographic negative record of the sound accompanying the scene on a high speed negative film run at about double the speed of the negative of the changing scene and simultaneously printing the two negative records on different portions of a positive film while running the two negatives at the same relative speed as in recording.

4. The method of producing a synchronized sound and moving picture record on the same film, which consists in forming a photographic negative of the changing scene, simultaneously forming a photographic negative of the sound accompanying the scene on a negative film run at approximately double the speed of the picture negative and simultaneously printing the two negatives on a positive film, the picture by contact and the sound through an optical system while maintaining the same relative speed of the negative as in recording.

In witness whereof, I hereunto subscribe my name this 1st day of April, A. D. 1924.

EDWARD C. WENTE.

L. J. R. HOLST.

PHOTOGRAPHIC PRINTING MACHINE.

APPLICATION FILED OCT. 23, 1914.

1,205,632.

Patented Nov. 21, 1916.

4 SHEETS—SHEET 1.

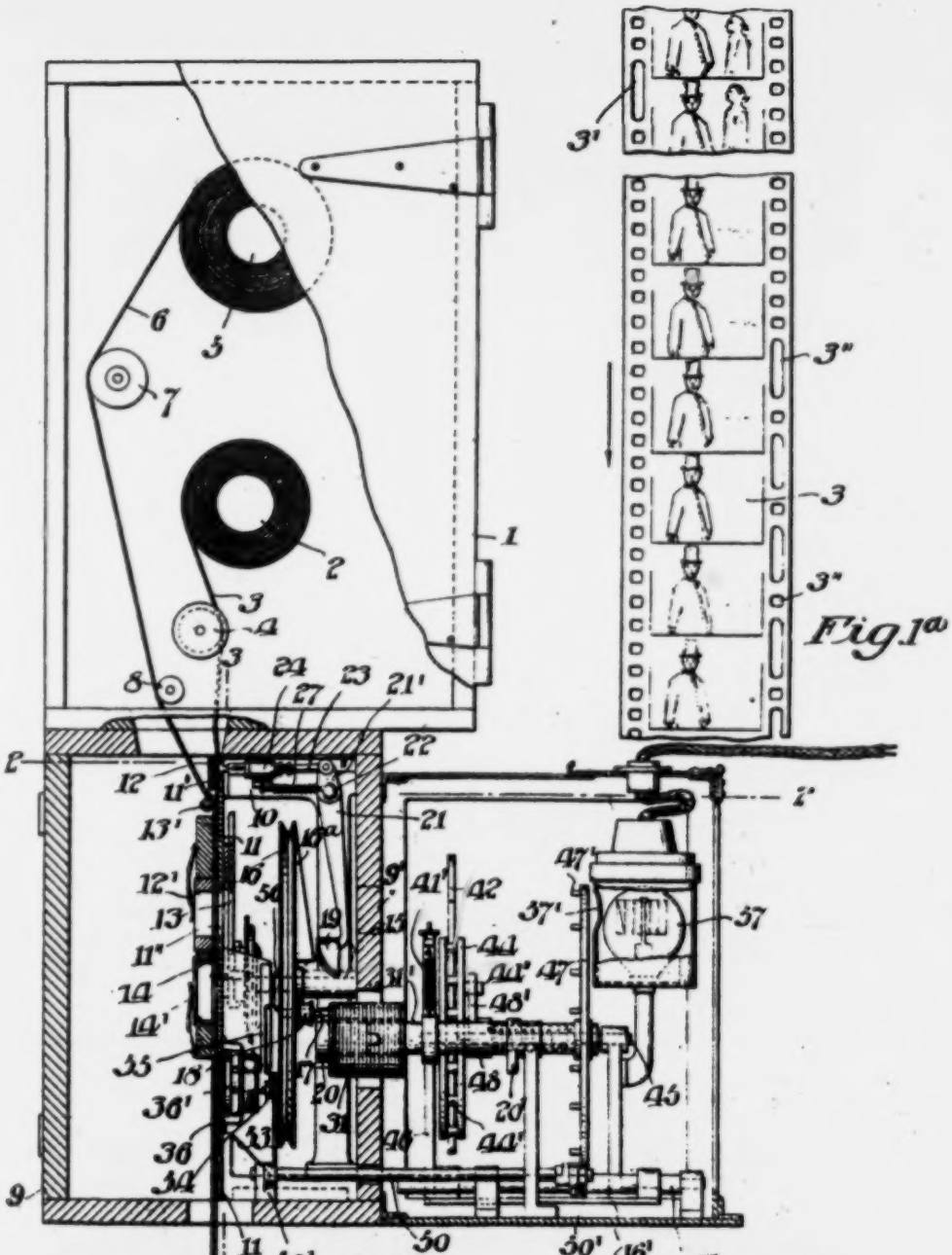


Fig. 1.

Fig. 1a

WITNESSES:

INVENTOR:

Lodewyk J. R. Holst.

ATTORNEY.

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PHOTOGRAPHIC PRINTING MACHINE.

APPLICATION FILED OCT. 23, 1914.

1,205,632.

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4 SHEETS—SHEET 2.

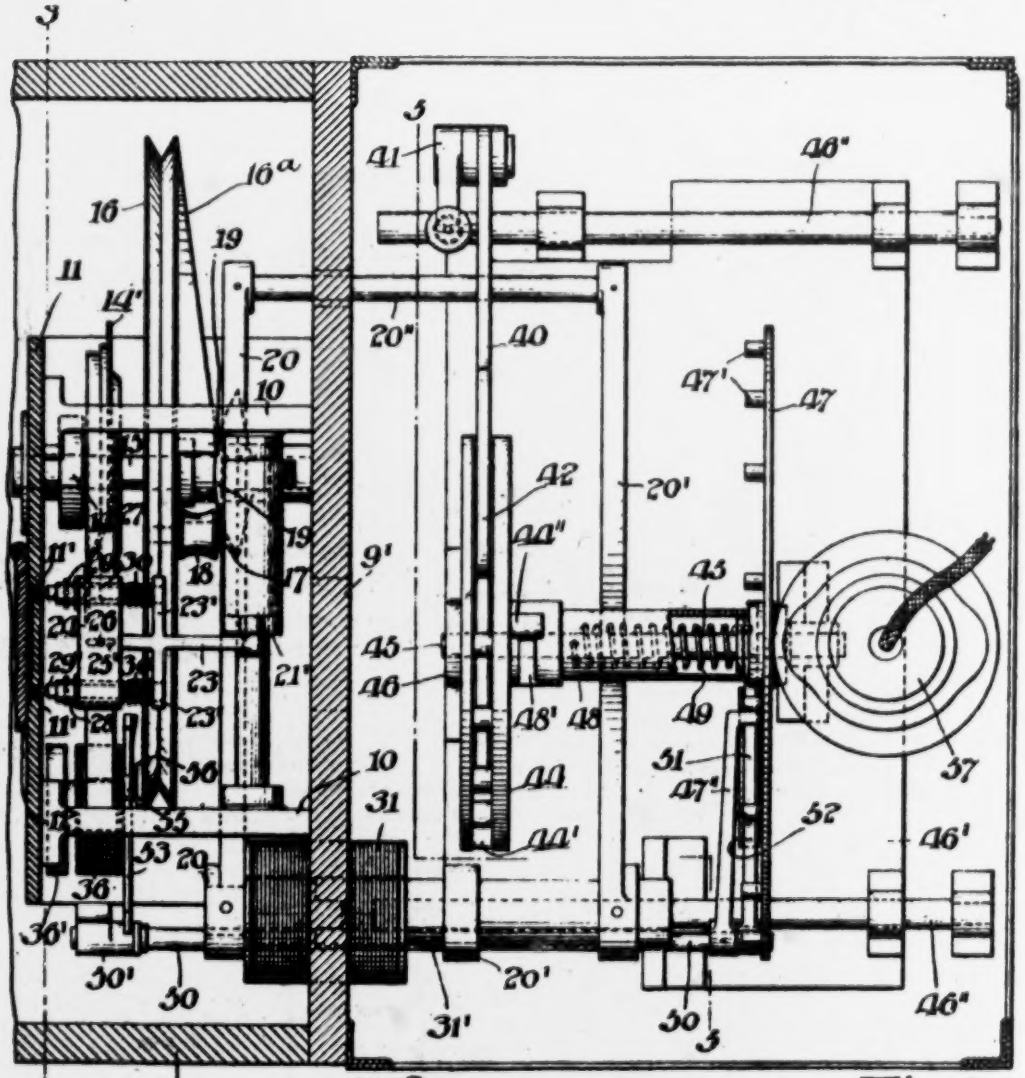

Fig. 2.

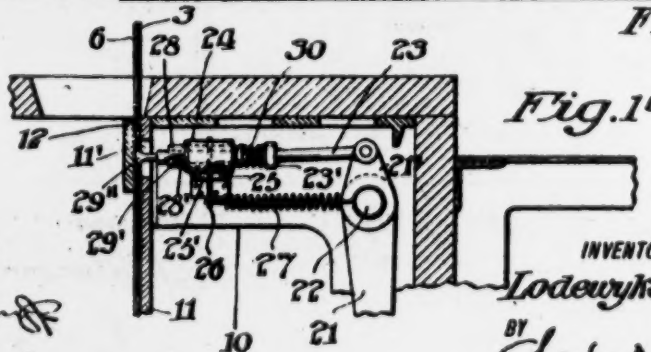

Fig. 1b

WITNESSES:

INVENTOR:

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PHOTOGRAPHIC PRINTING MACHINE.

APPLICATION FILED OCT. 23, 1914.

1,205,632.

Patented Nov. 21, 1916.

4 SHEETS-SHEET 1.

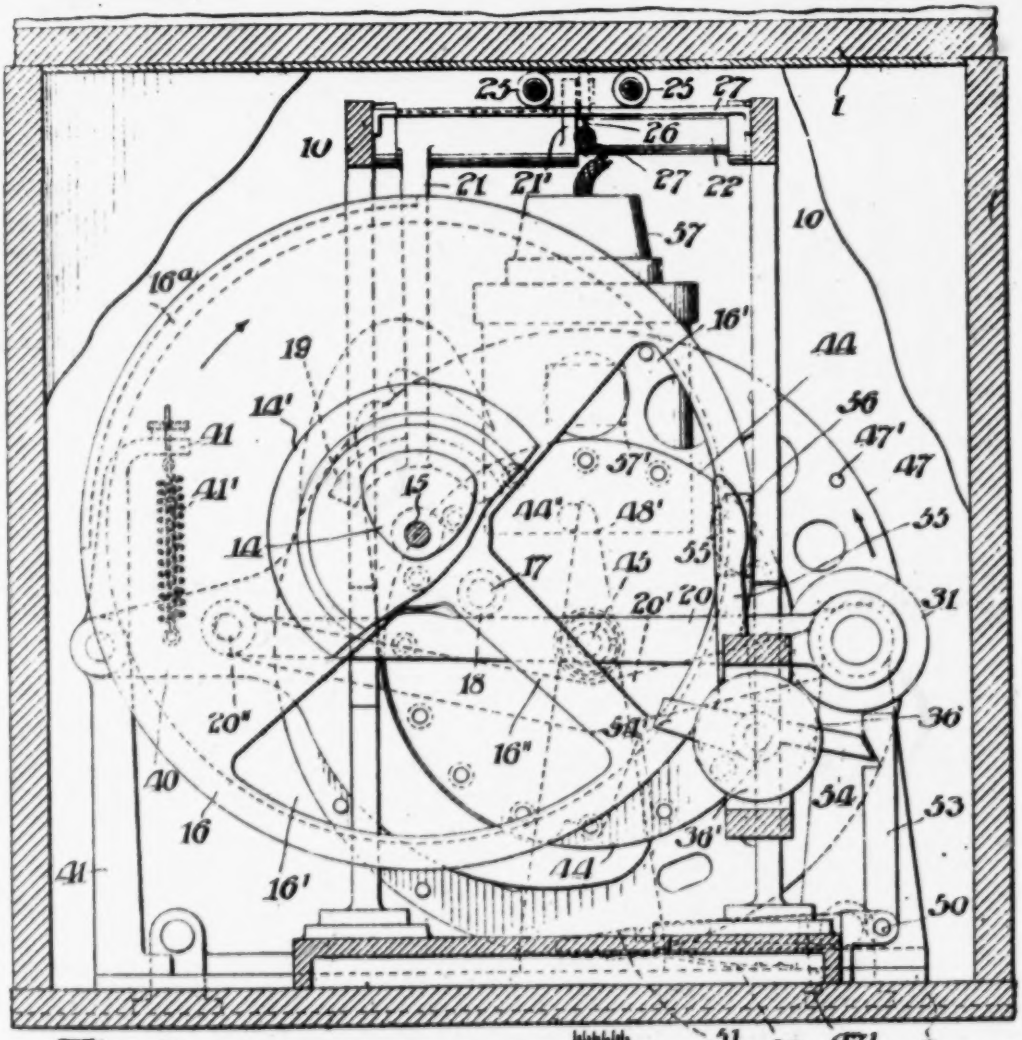

Fig. 3.

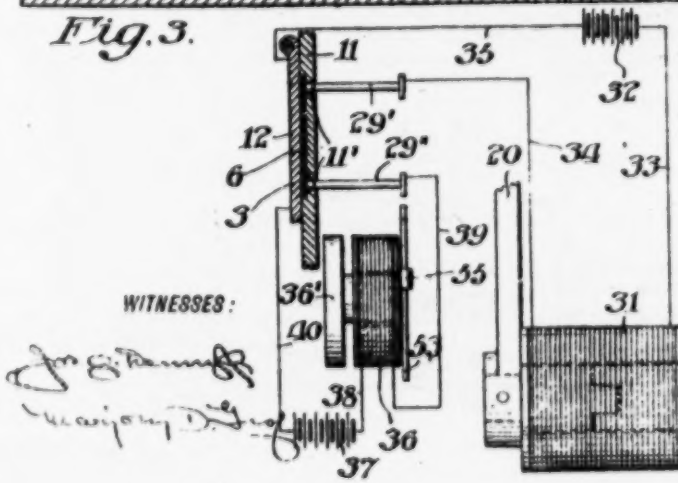

Fig. 4.

WITNESSES:

INVENTOR:
Lodewyk J. R. Holst,
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PHOTOGRAPHIC PRINTING MACHINE.

APPLICATION FILED OCT. 23, 1914.

1,205,632.

Patented Nov. 21, 1916.

4 SHEETS—SHEET 4.

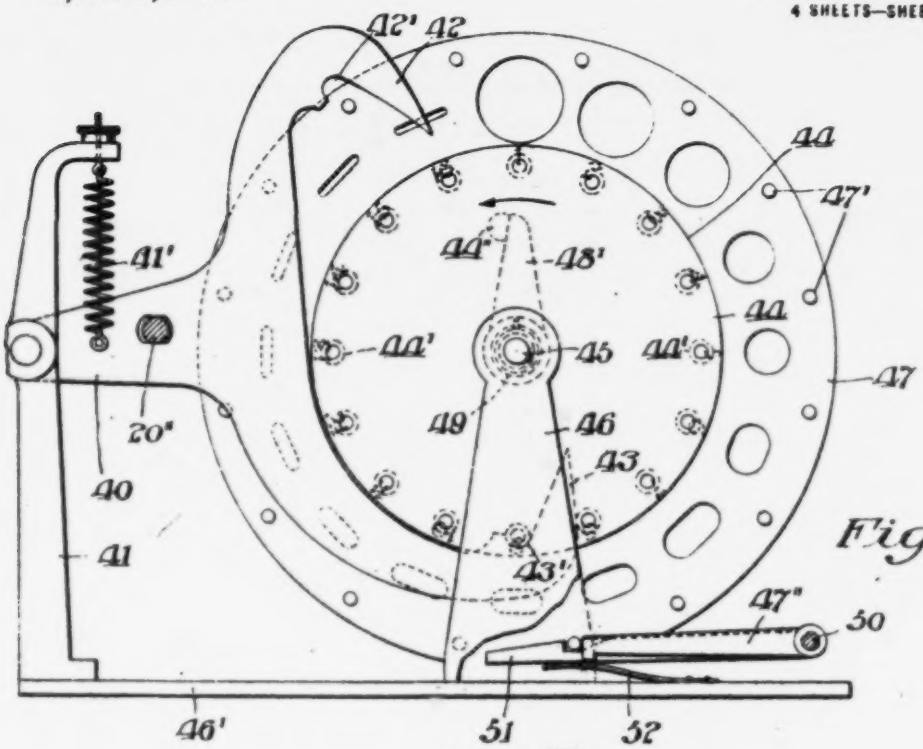

Fig. 5

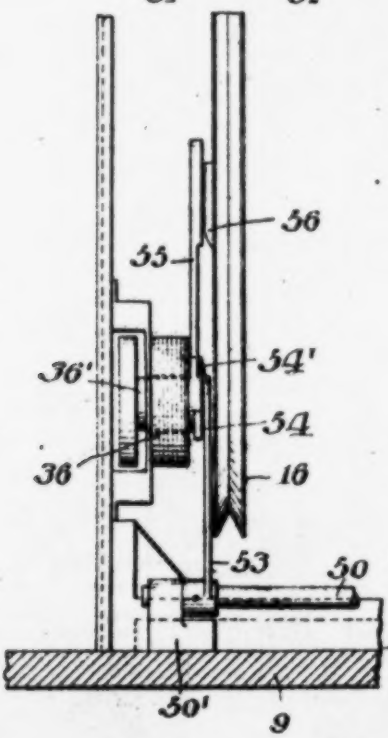

Fig. 6.

WITNESSES:

INVENTOR:
Lodewyk J. R. Holst,
BY Charles N. Butler
ATTORNEY.

UNITED STATES PATENT OFFICE.

LODEWYK J. R. HOLST, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO LUBIN FILM COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

PHOTOGRAPHIC-PRINTING MACHINE.

1,205,632. Specification of Letters Patent. Patented Nov. 21, 1916.

Application filed October 23, 1914. Serial No. 868,185.

To all whom it may concern:

Be it known that I, LODEWYK J. R. HOLST, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain Improvements in Photographic-Printing Machines, of which the following is a specification.

My invention is designed primarily for use in printing motion pictures, and its leading purpose is to obviate the necessity for printing separately and then joining together the several scenes which together form a picture story, but it will be evident that the invention is adapted for more general use.

Where several negatives are made separately under varying conditions of light and exposure, as is requisite in most instances in producing motion pictures, it has been necessary, in order to obtain satisfactory positive prints from such negatives, to make such prints separately so that the intensity of the light can be regulated in accordance with the density of the several negatives, the requisite printing light intensity being determined usually by test exposures as a guide in making the several positive prints separately.

The improvements of my invention contemplate, in the preferred form, joining the several negatives or negative sections together in proper relation, in accordance with test exposures, and providing such sections with special perforations, by means of which, in the operation of printing, an electric circuit or circuits are closed and mechanism operated thereby to automatically regulate the intensity of the light to that desired or in accordance with the density of the negative section to be printed.

The invention, as illustrated in the accompanying drawings, is adapted to a particular type of machine, but it will be understood that the design of the machine may be changed within the scope of the invention.

In the drawings, Figure 1 is a sectional elevation of the machine embodying my improvements; Fig. 1ª is a section of a motion picture film perforated or slotted for use therein; Fig. 1ᵇ is an enlarged sectional view of details of construction shown in Fig. 1; Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is an enlarged sectional view taken on the line 3—3 of Figs. 1 and 2 with the partition between the lamp and printing housings broken away; Fig. 4 is a sectional elevation of diagrammatical character illustrative of electrical mechanism comprised in the improvements; Fig. 5 is a broken sectional view taken on the line 5—5 of Fig. 2; and Fig. 6 is a broken sectional elevation of detached details of construction.

The machine, as illustrated in the drawings, comprises the case 1 containing the reel 2 from which the sectional negative film 3 is drawn over the roller 4, and the reel 5 from which the film 6 is drawn over the rollers 7 and 8.

The case 9, on which the case 1 is supported, contains the frame 10, which supports the plate 11 provided with the apertures 11′ and 11″ together with the doors 12 and 12′ adapted to close thereover. The doors 12 and 12′ coöperate with the plate 11 in guiding the negative film 3 across the apertures 11′ and 11″ as the film is drawn through the machine by the usual feeding device 13 operated by the cams 14 and 14′ fixed on the journaled shaft 15. The film 6 upon which the positive images are to be exposed through the negative film 3 is guided over the rollers 7, 8, and 13′ and makes contact with the negative film after having passed this latter roller. The positive film 6 is fed through the machine simultaneously with the negative 3 and by the same propelling mechanism.

A belt driven shutter wheel 16, which is fixed on and drives the shaft 15, contains the equal apertures 16′ separated by the spoke 16″. This wheel, a half or more of which is closed, is coördinated with the cam 14 so that when the end of the downward movement of the film by the cam has been effected the shutter wheel moves from a position covering the aperture 11″ to one uncovering

the same. The wheel 16 is provided with a pin 17 carrying a roller 18 and with a cam 16a. The pin is adapted to engage for about 90 degrees of its movement and during the period of exposure a cam 19, and the roller 18 is adapted to engage a bar 20 which is movable into the path thereof by mechanism hereinafter described and removable from said path by the cam 16a.

The cam 19 is fixed on the arm 21 which is connected with an arm 21', these arms being fulcrumed on the shaft 22. A bar 23, having the transversely projecting arms 23', connects the arm 21' with a block 24 which is movable on the supporting plate 25 attached to the frame 10, the block being provided with a pin 26 movable in the slot 25' in the plate 25 and connected by a spring 27 with the shaft 22. Insulating bearings 28 are carried in the ends of the block 25 and bolts 29' and 29'', having their forward ends in the apertures 11', are adapted to reciprocate in the block, the bearings being provided with the slots 28' and the bolts with the pins 29' movable therein. Springs 30 are disposed between the arms 23' and the heads of the bolts 29' and 29'', to move the latter forward and permit them to move backward within the bearings 28, and the spring 27 acts to hold the cam 19 in the path of the pin 17. The cam 14, causes the film strips to move downwardly in an intermittent manner, and is so placed with respect to the opening in the shutter wheel 16 that when the opening uncovers the printing aperture 11'' the film strips are at rest. During this period, the forward ends of the pins 29' and 29'' will rest against the negative film 3 if it presents its normal perforations, whereas either of these pins will pass through the film and rest against the metal door 12 in case the negative presents one of its special elongated perforations 3' or 3'' before them. The action of the spring 27 withdraws both these pins from contact with the film or with the door 12 before the film feeding mechanism operates to bring the succeeding picture before the printing aperture.

A solenoid 31 and any source of electric energy 32 are connected by the conductor 33, the solenoid being connected with the bolt 29' by a conductor 34 and the battery 32 being connected with the door 12 by a conductor 35. This circuit is automatically closed when slots 3'' of the negative film register with the bolt 29' so that the latter can make contact with the door 12.

A solenoid 36 and any source of electric energy 37 are connected by a conductor 38, the solenoid being connected with the bolt 29'' by the conductor 39 and the source of electric energy being connected with the door 12 by the conductor 40. This circuit is automatically closed when registering slots 3' of the films, during printing periods or periods of rest, register with the bolt 29'' and the latter engages the door 12.

The bar 20 and the downwardly bent lever 20', fixed together by the rod 20'', are fixed to the anchor 31' of the solenoid 31 which, when excited, moves these parts toward the wheel 16 and carries the bar 20 into the plane of the roller 18, the roller acting to depress the rod.

An escapement lever 40 is fulcrumed on the standard 41 and engaged by the rod 20'' which moves therethrough, and connected with a spring 41' which is anchored to the standard so as to tend to hold the lever elevated and elevate it when depressed by the rod. The lever is provided with the pallets 42 and 43 having the respective notches 42' and 43' at their bases, in the form of a usual escapement. A lantern wheel 44, provided with the trundles 44' adapted to be engaged by the pallets 42 and 43 and by the notches 42' and 43', is fixed on an arbor 45 journaled in the bearings or standards 46 on a carriage 46', the latter being movable on the ways 46'' and the wheel being intermittently advanced and locked by the reciprocation of the escapement lever 40.

A light disk 47, provided with graduated apertures numbered from 1 to 16 inclusive and corresponding in number with the trundles of the lantern wheel and with the pins 47' respectively disposed between adjacent apertures, has fixed thereto a sleeve 48 mounted concentrically in the arbor 45. The sleeve 48 is provided with an arm 48' adapted to engage a pin 44'' on the wheel 44. A spring 49 has one end fixed to the arbor 45 and the other to the sleeve 48, permitting a limited movement of the wheel 44 relative to the disk 47. When the arm 40 is depressed so that the tooth 42 engages and moves a roller 44' into the notch 42', tension is applied to the spring 49, which in turn applies force to the disk 47 tending to turn it in the direction of the arrow. The disk is normally held against the action of this spring by the engagement of a pin 47' thereon with a dog 47'' fixed on a shaft 50, which is journaled in the bearings 50'. A catch 51 is loosely mounted on the shaft 50 and supported by a spring 52 to cause it to engage any one of the pins 47', which makes contact with the dog and prevents backward movement of the light disk 47. When the locking dog 47'' is elevated to disengage the wheel 47, the latter, when subject to force communicated through the spring 49 under tension due to advancing the wheel 44, will be thrown forward until the arm 48' engages the pin 44''.

The shaft 50 has fixed on the opposite end

thereof an arm 53 (Figs. 3 and 6) adapted to be engaged and rocked by an arm 54 on the anchor or armature 36′ of the solenoid 36, the anchor also having fixed thereon an arm 55 which lies in the path of the cam or knocker 56 on the wheel 16 when the solenoid is excited. The knocker is arranged to engage the arm 55, at the end of an exposure, for the purpose of causing the arm 54 to act through the arm 53 and shaft 50 to elevate the door 47″, whereupon the spring 49 causes the disk 47 to be thrown forward to bring a succeeding light aperture (of area corresponding to the density of the next film section) into position during the period that the shutter obturates the exposure aperture 11″, the disk 47 being stopped by the engagement of the arm 48′ with the pin 44″ and locked in this position by the dog 51. When this has been effected, the circuit containing the electro-magnet 36 is broken and the armature 36′ is moved back by the engagement of the cam 56 with the arm 54′, thereby permitting the dog 47″ to again lock a pin 48″ of the wheel 47.

The lamp 57 is preferably of the glowing filament type and the light therefrom is projected through the aperture 57″ thereof, the aperture of the light disk 47 registering therewith, the aperture 9′ between the printing and lamp cases, an aperture 16′, of the disk 16, and the aperture 11″ of the plate 11 upon the films.

The apertures 1 to 16 of the light disk vary in area preferably so that from the smallest to the largest the succeeding apertures are 1.2 times as high as the preceding ones; those that are more than ½″ in height are preferably made circular and those of less height are preferably made ½″ in width. These apertures of varying area are designed to pass the amount of light required for the different densities of the various negative film sections.

In order to compensate for variations in the power of the light, which can be found by test, the carriage 46′, with the mechanism thereon, is moved along the ways 46″ so that the distance of the lamp from the film may be varied as required to produce the established standard intensity of the light.

The mechanism having been adjusted and the test prints of the negative sections having been obtained, these sections are joined together, with a leader attached to the first section. This leader and the successive film sections are then provided with the slots or elongated perforations 3′ and 3″ required to operate the light disk 47. If, for instance, the first section should require that the light be passed through aperture No. 6, five elongated holes are formed on the left side of the leader and one hole is formed on the right side of the first film section at a distance above the first image thereof equal to the length of the images between the apertures 11′ and 11″ less one. These slots or perforations, in the leader, by causing the circuit to be closed through the solenoid 31, cause the bar 20 to be drawn under the roller 18 and thereby to depress the arm 40, which is followed by the breaking of the circuit before the next forward movement of the films and the shifting of the bar 20 by the cam 16ª for each of the five perforations through which the circuit of the electro-magnet 31 is closed. Thus the wheel 44 is moved five steps forward. The slot on the right in the first negative section effects the release of the light disk during the period that the first picture of the first section moves into position registering with the opening 11″ in the plate 11 by closing the circuit through the solenoid 38. If thus the light disk has previously been placed at opening 1, it has been shifted by the described operations to opening 6 when the first picture of the first scene was exposed.

Assuming that the second section has a density requiring opening number 13 to be used, the wheel 42 will be turned by means of slots in the left side of any part of scene one whereas the single hole 3′ in the correct position on the right of section two releases the disk 47 in time to print the first image of scene two through opening 13.

It is to be understood that the number of holes required on the left side of each section, in order to bring the proper light aperture of the disk into position for the next section, is found by subtracting the number of the aperture in operative position from the number of the next one to be placed in position. If the latter number be lower than the first one, the number 16 is first to be added to the same and the subtraction made from the sum so obtained. That is to say, if the active aperture be number 6 and the next one to be used is number 4, add 16 to 4 and subtract 6, which indicates that fourteen holes must be turned in order to bring aperture 4 into operative position after aperture 6 has occupied such position. Furthermore, it will be understood that it is quite immaterial in which part of a preceding section the left hand holes for the advance of the wheel 44 are located, inasmuch as the light disk 47 will only follow the advance of the wheel 44 when liberated at the proper moment by the elongated hole in the right hand side of the succeeding section.

Having described my invention, I claim:

1. In a photographic printing machine, means for feeding a film, adjustable mechanism for regulating the light passing

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therethrough to said film, and automatic means for variably adjusting said mechanism proportionately to the density of the film.

2. In a photographic printing machine, means for feeding a film, a movable device for regulating the light passing to said film, and means for automatically moving said device variable predetermined distances proportionately to irregular differences of density between successive sections of said film.

3. In a photographic printing machine, the combination of revoluble shutter mechanism, a source of light, a device having apertures adapted for regulating the amount of light passed from said source of light through said shutter mechanism, and means comprising an electric circuit whereby said device is operated to change the aperture disposed between said source of light and shutter when the latter cuts off the light from said film.

4. In a photographic printing machine, revoluble shutter mechanism, a lamp, an apertured device revoluble between said lamp and shutter mechanism, means whereby said shutter mechanism turns said apertured device and changes the aperture through which light is passed, and electromagnetic mechanism whereby said means last named are brought into operative relation.

5. In a photographic printing machine, a shutter wheel, a lamp, a revoluble apertured device for passing light from said lamp through said shutter wheel, and means for operating said device by said shutter wheel, said means comprising a film, means for feeding said film across the path of light from said lamp through said apertured device and through said shutter wheel, and an electric circuit controlled by said film.

6. In a photographic printing machine, revoluble shutter mechanism, a lamp, a revoluble device having graduated light apertures adapted to be selectively disposed between said lamp and shutter mechanism, and means for operating said device, said means comprising a circuit and a photographic film for controlling said circuit whereby said apertured device is adjusted to pass a predetermined amount of light.

7. In a photographic printing machine, the combination with a film, of means for feeding said film, a device having a plurality of light passages for regulating the light passing to said film, and automatic means controlled by said film for selectively positioning non-consecutive passages aforesaid to pass light to said film.

8. In a photographic printing machine, the combination with a film comprising sections having different densities and perforations of varying character corresponding to said different densities, of film guiding means, mechanism for feeding said film, a lamp for projecting light on said film, a revoluble device containing apertures of different areas movable between said lamp and film, and means comprising an electric circuit normally held open by said film and adapted to be closed through said perforations, whereby said device is automatically operated by the corresponding character of said perforations to set apertures thereof adapted for passing the amount of light required for printing said film sections.

9. In a photographic printing machine, means for feeding a film, means for guiding said film, a lamp, a shutter wheel adapted for periodically interrupting light projected from said lamp upon a film carried by said guiding means, a revoluble device containing apertures of different areas movable across said lamp so as to regulate the amount of light projected thereby on said film, means for turning said device, a device carried by said shutter wheel for operating said means last named, and electro-magnetic mechanism adapted to be controlled by said film for controlling the relation between said last named means and the device of said shutter wheel for operating the same.

10. In a photographic printing machine, the combination with a film having sections of different densities and perforations corresponding to said densities, of film guiding means, means for feeding said film through said guiding means, an electric circuit adapted to be automatically closed through perforations aforesaid, a lamp, a revoluble device containing apertures adapted for regulating the amount of light passing from said lamp to said film, means for giving a step by step motion to said device for the purpose of changing the apertures thereof to pass the light required for printing, a revoluble device normally out of engagement with said means, and mechanism controlled by said circuit whereby said means last named is moved into position to be operated upon by said device last named.

11. In a photographic printing machine, a lamp, a revoluble device containing apertures of graduated sizes movable across said lamp, mechanism whereby said device is adapted to be turned to shift the apertures thereof, mechanism adapted for locking said device in various positions to be occupied thereby, means comprising a circuit containing an electro-magnet whereby said mechanism first named is shifted, a revoluble wheel having a device adapted for operating said mechanism first named in one position thereof, and mechanism comprising an electro-magnet for unlocking said device synchronously with the operation of said mechanism first named.

12. In a photographic printing machine, a film having sections of different densities, means for intermittently feeding said film, a shutter adapted for cutting off light from said film during the movements thereof, a circuit having devices separated by said film to open it and connected through said film to close it, a rocking mechanism, a device on said shutter for operating said mechanism, means comprising an electro-magnet in said circuit for moving said mechanism into and out of position to be operated by said device, a wheel operated by said mechanism, a light disk having graduated apertures, means whereby said wheel turns said disk, holding means for said disk, a second circuit having devices separated by said film to open it and connected through said film to close it, and means comprising an electro-magnet in said last circuit for releasing said holding means.

13. In a photographic printing machine, a film having sections of different densities and perforations corresponding thereto, means for feeding said film, a shutter adapted for cutting off light from said film, a circuit having devices separated by said film to open it and connected through said film to close it, a ratchet mechanism, a device on said shutter for operating said ratchet mechanism, means comprising an electro-magnet in said circuit and a cam on said shutter whereby said ratchet mechanism is brought into and moved out of operative relation with said device, means comprising a revoluble device containing graduated apertures operated by said ratchet mechanism, and a lamp for projecting light on said film through said apertures.

14. In a photographic printing machine, a film having sections of different densities and means for feeding said film, circuits controlled by said film, a lamp, a revoluble device having graduated apertures for passing predetermined amounts of light from said lamp to said film, and means comprising one of said circuits whereby said device is operated to permit the passage of light to said film corresponding to the densities of said sections and means comprising another of said circuits for controlling said operating means.

15. In a photographic printing machine, a film having sections of different densities, means for feeding said film, a circuit controlled by said film, a lamp, a device for passing predetermined amounts of light from said lamp to said film, and means comprising an adjustable stop controlled by said circuit whereby said device is adjusted for passing light to said film corresponding to the densities of its said sections.

16. In a photographic printing machine, a film having sections of different densities, means for feeding said film, circuits controlled by said film, a lamp, a device for passing predetermined amounts of light from said lamp to said film, and means controlled by said circuits whereby said device is adjusted for passing light to said film corresponding to the densities of said sections, said last named means comprising solenoids controlled by said circuits and mechanisms under control of said solenoids whereby said device is adapted to be alternately locked and operated.

17. In a photographic printing machine, a lamp, a revoluble disk containing graduated apertures for passing light from said lamp, locking means for holding said disk, a ratchet mechanism, flexible mechanism through which said ratchet mechanism is adapted to turn said disk, a film, means for feeding said film, a revoluble shutter, and means whereby said film releases said locking mechanism, said means comprising a rock arm, and means comprising a device on said shutter for rocking said arm.

18. In a photographic printing machine, a lamp, a revoluble disk containing graduated apertures for passing light from said lamp, disk operating mechanism comprising a spring adapted to be put under tension, locking mechanism for holding said disk, a film, means for feeding said film, a shutter revoluble between said disk and film, and means whereby said film and shutter operate said operating and locking mechanisms.

19. In a photographic printing machine, a lamp, a revoluble disk containing graduated apertures for passing light from said lamp, disk operating mechanism comprising a spring adapted to be put under tension, locking mechanism comprising a dog for holding said disk, a film, means for feeding said film, a shutter revoluble between said disk and film, an electric circuit controlled by said film, an electro-magnet in said circuit, means controlled by said electro-magnet for operating said locking mechanism, and a device carried by said shutter for operating said means last named.

20. In a photographic printing machine, a lamp, a revoluble disk containing graduated apertures for passing light from said lamp, disk operating mechanism, locking mechanism for said disk, a film, means for feeding said film, an electric circuit controlled by said film, an electro-magnet in said circuit, an armature for said electro-magnet and a lever thereon, said lever being movable by said armature into and out of engagement with said locking mechanism, and a revoluble device for operating said lever when in engagement with said locking mechanism.

21. In a photographic printing machine, film feeding mechanism, a device for regulating the light passing to said film, means comprising a circuit containing a contact for

actuating said device, and means for moving said contact toward and from the path of said film.

22. In a photographic printing machine, means for feeding a film, a device for regulating the light passing to said film, mechanism for operating said device, means for holding said device against the action of said mechanism, and means controlled by said film for releasing said device.

23. In a photographic printing machine, a light regulator, mechanism for operating said light regulator, driving means, means for moving said mechanism into the path of said driving means, and a device connected with said driving means for moving said mechanism from the path of said driving means.

In testimony whereof I have hereunto set my name this 17th day of October, 1914, in the presence of the subscribing witnesses.

LODEWYK J. R. HOLST.

Witnesses:
JOS. G. DENNY, Jr.,
C. N. BUTLER.

655

J. TESSIER.

MOTION PICTURE PRINTING MACHINE.

APPLICATION FILED AUG. 21, 1914.

1,205,582.

Patented Nov. 21, 1916.

4 SHEETS—SHEET 1

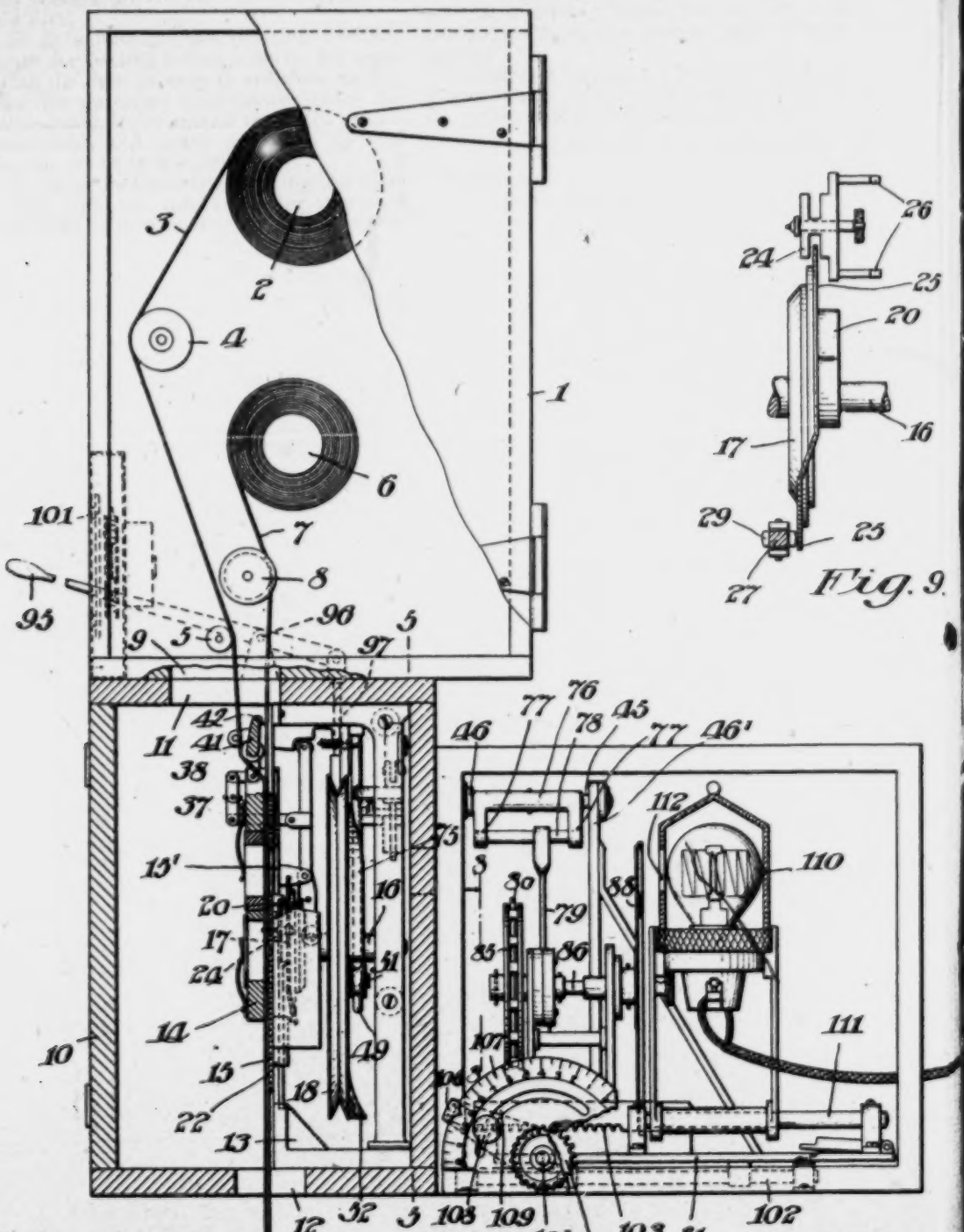

Fig. 1.

Fig. 9.

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INVENTOR:

Julien Tessier

BY Charles N. Burch

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656

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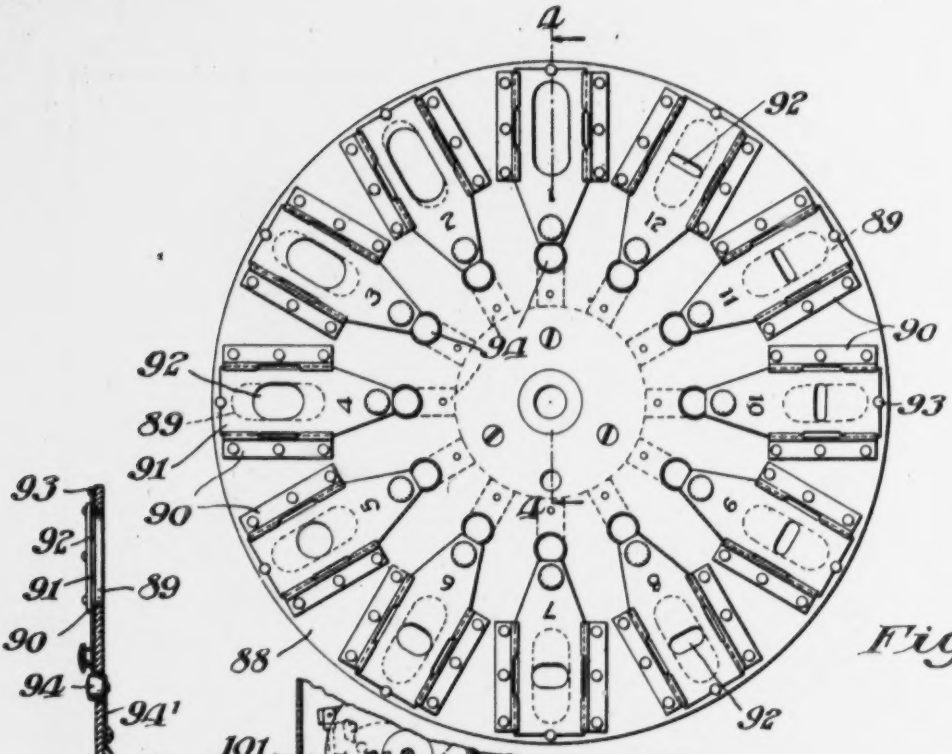
MOTION PICTURE PRINTING MACHINE.

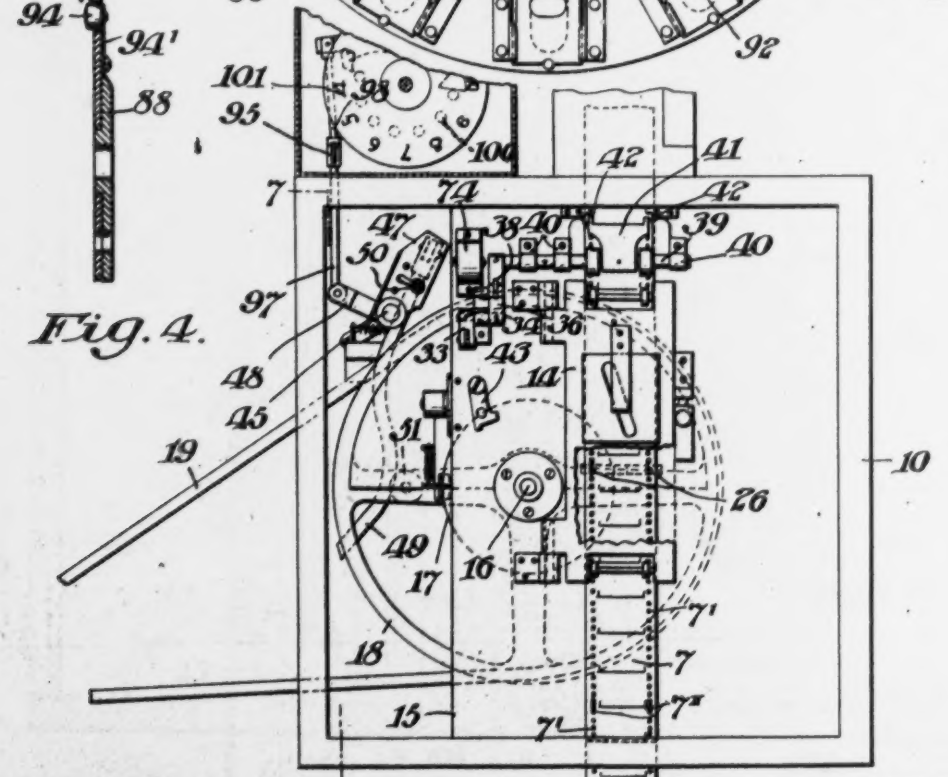
APPLICATION FILED AUG. 21, 1914.

1,205,582.

Patented Nov. 21, 9

4 SHEETS—SHEET.





WITNESSES:

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INVENTOR:

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BY

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657

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MOTION PICTURE PRINTING MACHINE.

APPLICATION FILED AUG. 21, 1914.

1,205,582.

Patented Nov. 21, 19

4 SHEETS—SHEET 3.

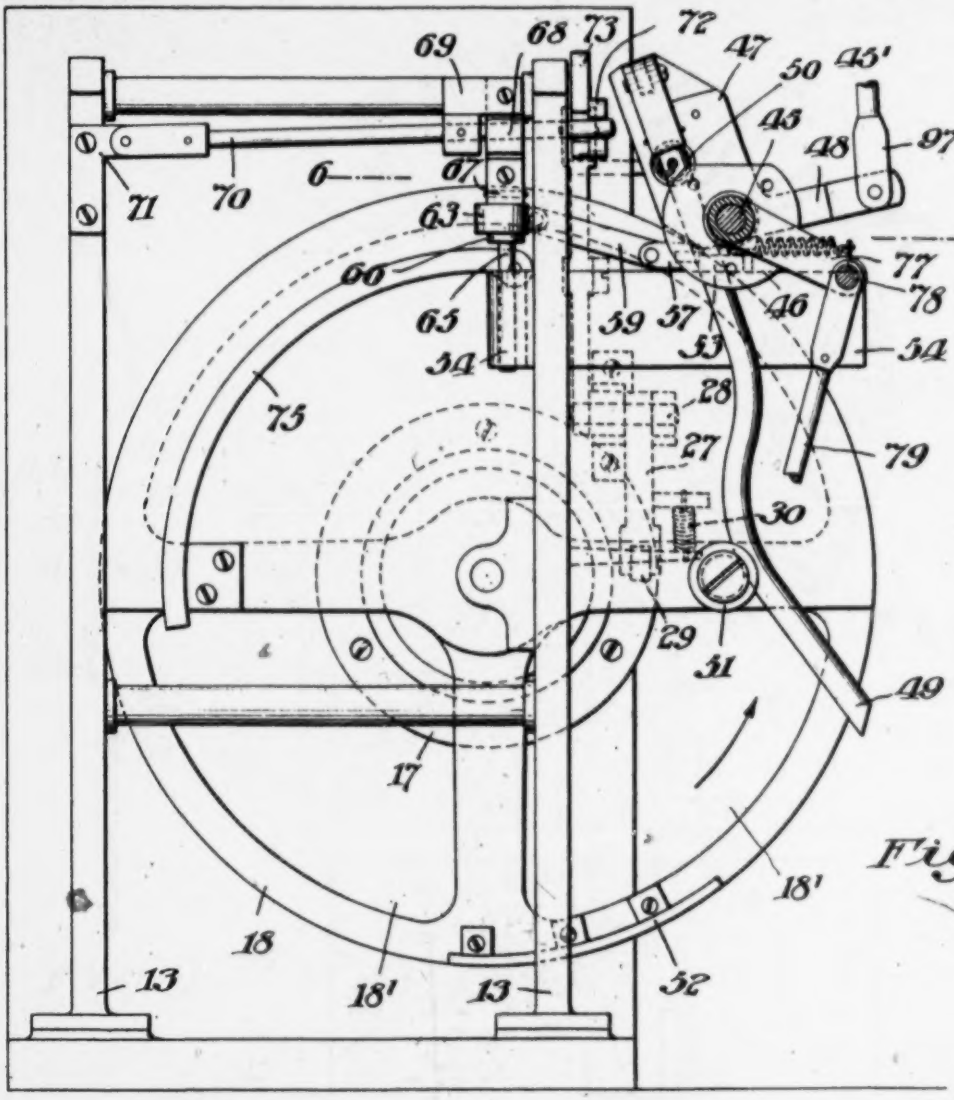

Fig. 5.

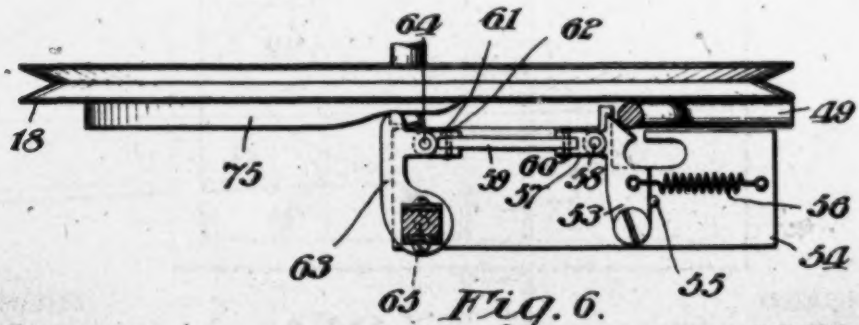

Fig. 6.

WITNESSES:

R. Schleicher

INVENTOR:

Julien Tessi

BY

Charles N. Bull

J. TESSIER.

MOTION PICTURE PRINTING MACHINE.

APPLICATION FILED AUG. 21, 1914.

1,205,582.

Patented Nov. 21, 1

4 SHEETS—SHEET

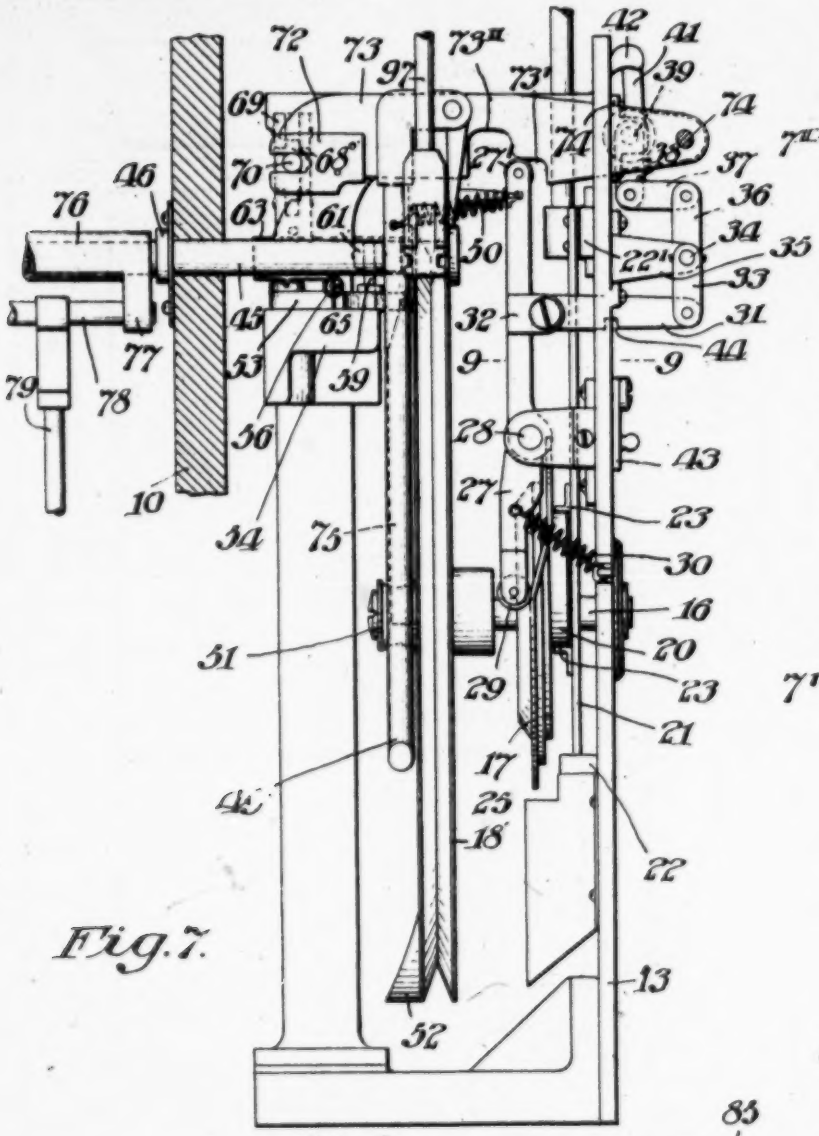

Fig. 7.

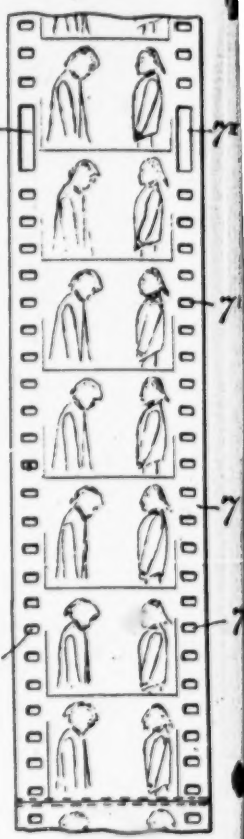

Fig. 10.

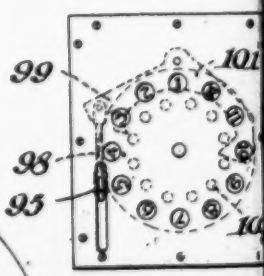

Fig. 11.

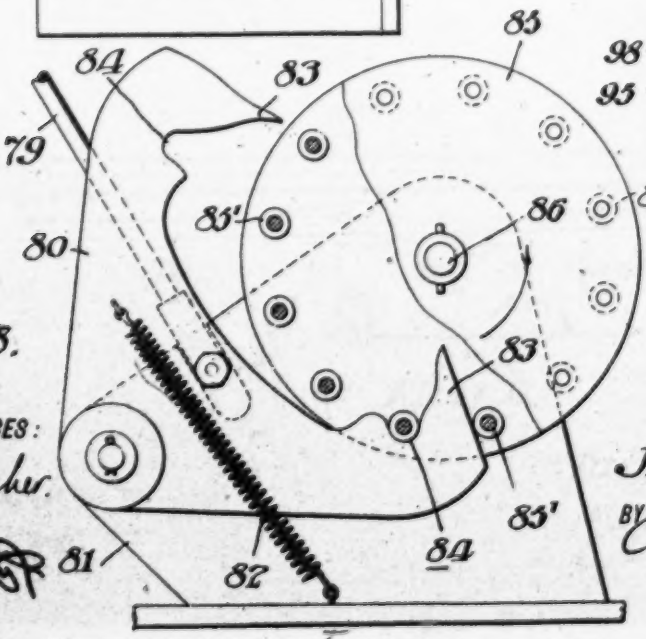

Fig. 8.

WITNESSES:

R. Schleicher.

INVENTOR:

Julien Tes

BY

ATTORNEY.

UNITED STATES PATENT OFFICE.

JULIEN TESSIER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO LUBIN FILM COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

MOTION-PICTURE-PRINTING MACHINE.

1,205,582. Specification of Letters Patent. Patented Nov. 21, 1916.

Application filed August 21, 1914. Serial No. 857,830.

To all whom it may concern:

Be it known that I, JULIEN TESSIER, a citizen of France, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain Improvements in Motion-Picture-Printing Machines, of which the following is a specification.

In motion picture photography, different parts of the same subject are very commonly photographed at different times or under different conditions, so that different sections of the negative film are subjected to different exposures and have different densities which must be corrected or compensated for in printing the positives from the negatives in order to have uniformity in the projected pictures.

It is the leading object of my invention to provide a printing machine which is adapted to be adjusted initially and to be automatically operated so that the light used in printing will be proportioned to the density of the film section and the positive produced will be uniform in character, to the end that printing may be effected with improved results and without the loss of time that has heretofore obtained.

In the accompanying drawings, Figure 1 is a sectional elevation of a printing machine embodying my invention; Fig. 2 is a part sectional front elevation of the same with parts broken away and the front of the cases removed; Fig. 3 is an elevation of the revoluble light disk provided with slides for regulating the amount of light passed for use in printing; Fig. 4 is a broken sectional view taken on the line 4—4 of Fig. 3; Fig. 5 is an enlarged view taken on the line 5—5 of Fig. 1; Fig. 6 is a view of details partly in section taken on the line 6—6 of Fig. 5; Fig. 7 is an enlarged sectional view taken on the line 7—7 of Fig. 2; Fig. 8 is an enlarged sectional view taken on the line 8—8 of Fig. 1; Fig. 9 is a view of a cam wheel and connections from the section line 9—9 of Fig. 7; Fig. 10 is a view of a section of film adapted to be used with my improvements; and Fig. 11 is a view of a dial for indicating the position of the apertured disk for regulating the amount of light used.

The mechanism, as illustrated in the drawings, comprises the case or house 1 which contains the spool 2 for the positive film 3 which is drawn therefrom over the rollers 4 and 5, and the spool 6 for the negative film 7 which is drawn therefrom over the roller 8, the films passing from the rollers through the aperture 9 in the bottom of the case. A case or house 10 supports the case 1, contains a top aperture 11 which registers with the aperture 9 and is provided with a bottom aperture 12, the films being drawn from the spools, over the rollers and through the apertures in the operation of printing.

A frame 13 is contained in the case 10 and has the door 14 hinged on its front plate 15, the films passing between the plate and the closed door in the operation of printing.

An arbor 16 is journaled in the frame and has fixed thereon the wheels 17 and 18, the latter being provided with the light apertures 18′ and driven by a belt 19. As the wheel 17 revolves, a cam 20 thereon reciprocates the yoke 21 which is controlled by the vertical guides 22 and 22′, and provided with the laterally projecting bearings or lugs 23 for engaging the periphery of the cam. A yoke 24 is carried by the yoke 21, engages the peripheral cam 25 of the wheel 17 and carries the pins 26 which engage the perforations 7′ along the edge of the films to feed the latter in a well known manner, the shutter wheel 18 cutting off the light when the films are moving and passing light when they are at rest.

A lever 27 has the fulcrum 28 on the frame and the roller 29 which is pressed against a face of the cam 25 by a spring 30 connecting the lever with the frame. A link 31 is pivoted on the bearing 32 of the lever 27 and connected with an arm 33 fixed on a pin or short shaft 34, which is journaled in a bearing 35 on the plate 15. An arm 36 is fixed on the pin 34 and connected by a link 37 with an arm 38 fixed on a shaft 39 which is journaled in bearings 40 on the plate 15. A shoe 41 is fixed on the shaft 39 and provided with the toes 42 which ride on the edges of the negative film, over the perforations 7′, but drop into the slots 7″ formed in a predetermined manner in the edges of film sections of different densities, the member 41 being rocked by the spring 30 and the intermediate mechanism when the offset section of the cam 25 registers with the roller 29. When it is desired to hold this mechanism out of operation, a dog 43, pivoted on the

plate 15, is engaged in the notch 44 of the link 31.

A shaft 45 is journaled in the bearings 46 and 46′ and has the arms 47 and 48 fixed thereon. An arm 49 is pivoted on the arm 47 and is further connected with a laterally extending projection on the arm 47 by a coiled spring 50, the latter passing through the arm 47.

The wheel 18 is provided with a roller or rolling cam 51, adapted to engage the arm 49 and cause it to rock the arms 47 and 48, and with a cam 52 adapted for throwing the arm 49 away from the roller into engagement with the catch 53 which is pivoted on the bearing 54 and normally held against the stop 55 by the spring 56. A coupling 57 is pivotally connected with the catch 53 by the pin 58 and with the link 59 by a pin 60 disposed transversely to the pin 58; and a coupling 61 is pivotally connected with the link by a pin 62 and with a rocker arm 63 by a pin 64 disposed transversely to the pin 62. The arm 63 is journaled on a pin 65 on which it is held by a collar 66, the pin being movable in the bearing 54 and supported by a knuckle 67. A coupling 68 is pivotally connected with the knuckle 67 and with an angular block 69 which is pivoted on a lever 70. The lever 70 is pivoted at one end on the bearing 71 and at its other end engages a seat 72 on one end of a lever 73, the other end of which is pivoted on the bearing 74.

The lever 73 rests on the roller 27′ on the top of the lever 27, the former lever having the steps 73′ and 73″ which engage the roller 27′ in the different positions of the lever 27.

When the cam 25 rocks the lever 27 against the action of the spring 30, so that the toes 42 are drawn back from the film 3, the step 73′ is engaged by the roller 27′ to hold the levers 73 and 70, together with the members 69, 68 and 63 in their elevated position, so that the cam 75 on the wheel 18 clears the arm 63. When the cam 25 has turned so that its offset section permits the spring 30 to rock the lever 27, the roller 27′ can be swung under the notch 73″, whereupon the levers 73 and 70, together with the members 69, 68, 67 and 63 fall and the arm 63 is held in the path of the cam 75. When the cam 75 engages the arm 63, the latter is rocked and acts through the intermediate parts to draw back the catch 53, whereupon the spring 50 pulls the arm 49 into position to be engaged by the roller 51, which rocks the shaft 45.

A sleeve 76 is fixed on the shaft 45 and is provided with the arms 77 which carry a rod 78. A rod 79 is connected at its top with the rod 78 so as to move along the same, and at its bottom with the rocker 80, which is fulcrumed on the carriage 81. A spring 82 connects the rocker with the carriage and acts to draw the former down, it being elevated by the rod 79. The rocker is provided with the pawls 83 and notches 84 adapted for engaging trundles 85′ of the lantern wheel 85 carried by the spindle 86 which is journaled on the carriage 81, the wheel being revolved step by step by the oscillation of the rocker which locks it in its successive positions.

The spindle 86, which carries the wheel 85, has fixed thereon a disk 88 containing radial slots 89 and guides 90. In these guides are movable slides 91 having radial slots 92 of varying size corresponding to the numbers 1 to 12 thereon, the slides being held in position by studs 93 and 94, the latter supported by springs 94′ so as to be movable away from the slides.

The disk 88, which is adapted to be turned intermittently by the action of the arm or lever 49 through the related mechanism described, is also adapted to be operated by a hand lever 95 having the fulcrum 96 and connected with the arm 48 by a link 97. The lever 95 is connected by a link 98 with a double toothed pawl 99 which acts on the trundles 100 of a dial 101 which carries the numerals 1 to 12 arranged in correspondence with the like numerals on the disk 88.

The carriage 81, movable on ways 102, is moved by a rack 103 thereon which is engaged by a pinion 104 fixed on a journaled shaft 105. The shaft has an indicating arm 106 fixed thereon, movable over a fixed dial 107 and adapted to be fixed thereto by the clamp screw 108 which passes through the slot 109 in the dial. A lamp 110 is mounted on the carriage 81, being movable on the ways 111 thereof relatively to the disk 88. The lamp's light aperture 112 is in line with the disk 88's top aperture, which is at rest in a vertical diameter of the disk, and with the aperture 15′ in the plate 15 over which the films are moved intermittently. It will be understood that the adjustments of the carriage 81 and the lamp 110 permit compensation to be made for variations in the candle power of the light used for printing and that the light apertures of the disk cut off light so that the same shall be proportionate to the densities of the film sections previously arranged and perforated.

The film 7 having been made up by combining sections of different densities, such film is arranged on the spool 6 and drawn therefrom as the blank film 3 is drawn from the spool 2, the two passing between the door 14 and the plate 15, past the light aperture 15′.

In order to initially adjust the mechanism for accommodation to the densities of the negative, the hand lever 95 is operated to turn the dial 101 (through the action of the parts 98 and 99) and the disk 88 (through

the action of the parts 97, 48, 45, 76, 77, 78, 79, 80, 85, and 86) until the numeral displayed at the top of the dial indicates that the desired light aperture of the disk is in line with the lamp aperture 112. The apparatus being thus adjusted, the films hold the toes 42 of the member 41 in their retracted position and the member 41 acts (through the parts 39, 38, 37, 36, 34, 33, and 31) to hold the lever 27 in the position shown in Fig. 7, where the roller 27′ engages the step 73′ and holds in the elevated position the parts 73, 70, 69, 68, 67, and 63. With the mechanism in this position, the arm 49, which has been engaged by the dog 53, is held out of engagement with the roller 51 and the position of the disk 88 is undisturbed by the revolution of the shutter wheel 18. As the wheel 18 revolves, the simultaneously revolving cam 20 reciprocates the yoke 21 vertically and the cam 25 causes the yoke 24 to reciprocate horizontally in the yoke 21, whereby the fingers 26 are caused to engage the perforations 7′ of the films and feed them intermittently across the aperture 15′ while the same is covered by the shutter wheel 18.

When a film section of different density passes under the toes 42, the latter drop into the slots 7″ simultaneously with the registration of the offset part of the cam 25 with the roller 28, whereupon the spring 30 throws the lever 27; the roller 27′ is moved from the step 73′ to a point below the step 73″; the part 73, together with the parts connecting it with the arm 63, drops so that the latter is brought into position to be actuated by the cam 75, and the arm 63 is caused to act through the intermediate mechanism on the latch 53 to release the lever 49. The spring 50 now draws the lever 49 into the path of the roller 51, which causes the lever to rock the arm 47, whereby the disk 88 is turned, as previously described, to present in front of the lamp the next light aperture adapted for passing the light required for the particular density of the film. It will be understood that the slides 91 have been arranged initially in sequence so that each forward step of the disk 88 will present a light aperture corresponding to the density of the negative section which is being transferred to the positive film.

Having described my invention, I claim:

1. In a motion picture machine, driving mechanism, film feeding devices operated by said mechanism, a light regulator, and means controlled by a film carried by said devices whereby said driving mechanism is connected with and operates said regulator intermittently.

2. In a motion picture machine, film feeding devices, a light regulator, a revoluble device, means whereby said revoluble device operates said regulator, and means normally supported by a film carried by said film feeding devices for rendering said first named means inoperative.

3. In a motion picture machine, a light regulator, an actuating device, mechanism comprising a rocking member whereby said device operates said regulator, and means for moving said member into and out of position to be operated upon by said device.

4. A motion picture printing machine provided with a shutter having apertures of different sizes for passing light to intermittently moving films, one of which has sections of different densities and is provided with perforations and mechanism comprising a lever coacting with the film aforesaid having perforations therein for shifting said shutter so as to position an aperture thereof adapted for passing the amount of light desired for printing from a coördinated film section.

5. A motion picture printing machine provided with a shutter having means for passing different amounts of light to intermittently moving films, one of said films having sections of different densities and containing perforations coördinated with said sections, and means with which said perforated film coöperates to shift said shutter and position means for passing the amount of light required by the density of the film section, said means comprising a lever mechanism adapted to contact with said perforated film so that it can be shifted when registering with perforations thereof, a cam for rocking said lever mechanism, a second lever mechanism acting in coördination with said lever mechanism first named to throw a catch, an arm adapted to be held out of operative position by said catch until the latter is thrown, a wheel by which said arm is rocked, and means operated by the arm for adjusting the position of the shutter.

6. A motion picture printing machine provided with a shutter having apertures of different sizes for passing different amounts of light to intermittently moving films, one of which has sections of different densities and contains perforations coördinated with said sections, and means with which said film last named coöperates to shift said shutter and position apertures for passing the amount of light required by the different densities of the different film sections, said means comprising automatically acting mechanism having a part bearing on said perforated film and adapted to enter perforations thereof to coördinate the mechanism's action with the density of a corresponding film section, a catch thrown by said mechanism, an arm automatically thrown when disengaged by throwing the catch, a wheel having a device for causing the arm to rock a shaft and a cam for throw-

ing the arm into engagement with the catch out of the path of the device, and mechanism operated by the shaft for shifting the shutter and positioning the apertures thereof.

7. The combination of a driving shaft, film feeding mechanism operated by said shaft, means for projecting light on a section of film fed by said mechanism, and means operated through said shaft under the control of said film for varying the amount of light projected as the density of said film changes.

8. The combination of film feeding devices, a driving wheel for operating said devices, means for projecting light on a section of film fed by said devices, a shutter having means for regulating the amount of light projected on said film, and means operated by said driving wheel for operating said shutter intermittently.

9. The combination, in a photographic printing mechanism, of a film, mechanism for projecting light on a section of said film, a device for varying the amount of light projected on said film, and means operated under control of said film for operating said device, said means comprising revoluble cam mechanism and an arm movable about transverse axes by cams of said last named mechanism whereby said means are thrown into and out of position for operating said device.

10. The combination, in a photographic printing machine, of a film, mechanism for projecting light on a section of said film, a device for varying the amount of light projected on said film, means comprising a shaft for operating said device, an arm adapted for turning said shaft, a revolving member adapted for rocking said arm to effect the turning of said shaft and a cam for moving said arm out of the path of said member to prevent the operation of said device.

11. The combination, in a photographic printing machine, of a film, mechanism for projecting light on a section of said film, a device for varying the amount of light projected on said film, and means for operating said device to automatically vary the light in a predetermined manner, said means comprising an arm adapted to rock in transverse directions, a revoluble member for rocking said arm to effect the movement of said device, and a revoluble member for rocking said arm to prevent its engagement by said member first named.

12. The combination, in a photographic printing machine, of mechanism for regulating light projected for the printing operation, and means for effecting a controlled operation of said mechanism, said means comprising a revoluble wheel having cams thereon, an arm adapted to be moved by one of said cams to effect an operation of said mechanism and by another of said cams to prevent the operation of said mechanism, a device for engaging and holding said arm out of the path of the cam for effecting its first named movement, and means for disengaging said device at predetermined intervals to permit said arm to be operated by the cam first specified.

13. The combination, in a photographic printing machine, of mechanism for projecting light for the printing operation, means comprising a device having variable apertures for regulating the light projected for said printing operation, a revoluble wheel, an arm adapted to move in transverse directions for moving and avoiding the movement of said means, a part on said wheel for operating said arm to effect the movement of said means, a cam on said wheel for moving said arm out of position for engaging said part to avoid the operation of said means, a catch for holding said arm when thrown by said cam, a second cam on said wheel, and means whereby said second cam is caused to operate said catch at predetermined intervals to release said arm and permit the operation of said means first named thereby.

14. The combination, in a photographic printing machine, of a film, means for feeding said film, means for projecting light on said film, and light regulating means operated by said film, said regulating means comprising a shaft, a device connected with said shaft for turning it, a wheel, a part on said wheel for operating said device to turn said shaft, a catch, a second part on said wheel for throwing said device out of the path of said part first named and into engagement with said catch, mechanism for moving said catch to release said device, a third part on said wheel for operating said mechanism, a cam revoluble with said wheel, and means comprising members controlled by said cam and film whereby said mechanism is moved into and out of position to be engaged by said third part.

15. The combination, in a photographic printing machine, of a film, means for feeding said film, means for projecting light on said film, and light regulating means operated by said film, said regulating means comprising a rock shaft, an arm connected with said shaft, a second arm pivoted to said first arm, a catch, a wheel, a part on said wheel for engaging said second arm to rock said arms and shaft, a second part on said wheel for throwing said second arm out of the path of said first part into engagement with said catch, mechanism connected with said catch for disengaging it, a third part on said wheel for operating said mechanism to withdraw said catch, devices for shifting said mechanism out of and into the path of said third part, a revoluble cam, and means

said film and a part operated under control of said cam for shifting the position of said devices.

16. The combination, in a photographic printing machine, of a film, means for feeding said film, means for projecting light on said film, and light regulating means operated under control of said film in a predetermined manner, said regulating means comprising a revoluble device having variable light apertures adapted to be adjusted to the densities of different sections of said film, a ratchet mechanism for giving a step by step movement to said device, reciprocatory mechanism for operating said ratchet mechanism, and revolving devices adapted for operating said reciprocatory mechanism.

17. The combination, in a photographic printing machine, of a perforated film, means for feeding said film, means for projecting light on said film, and light regulating means operated in a predetermined manner by said feeding means under control of said film, said light regulating means comprising devices arranged in sequence for passing therethrough light proportional to densities of said film, said devices being movable to change the sequence thereof.

18. The combination, in a photographic printing machine, of a film containing slots arranged in a predetermined manner, means for feeding said film, a shoe adapted to ride on said film and to enter said slots, a revoluble cam, mechanism connecting said shoe and cam whereby said cam withdraws said shoe from said slots, a revoluble wheel having a cam thereon, a rocker arm, means controlled by said mechanism whereby said rocker arm is shifted into and out of the path of said cam, a revoluble device containing variable light apertures for regulating the amount of light passed for printing, means comprising a second cam on said wheel for turning said device, mechanism comprising a third cam on said wheel for throwing said means last named out of position to be operated by said second cam, and means whereby said arm releases said last named mechanism.

19. The combination, in a photographic printing machine, of a carriage, means for moving said carriage, a disk journaled on said carriage, apertured slides carried by said disk, a lamp adapted for projecting light through the apertures of the respective slides when brought into position therefor, a ratchet mechanism carried by said carriage for turning said disk, a rocking mechanism adapted for operating said ratchet mechanism, said rocking mechanism having an actuating member, a wheel having a cam for operating said actuating member, a cam on said wheel for throwing said actuating member away from said cam first named to inoperative position, means for holding said actuating member in said inoperative position, a film, a second wheel provided with a cam and means whereby said last named wheel and said film release said actuating member.

20. The combination, in a photographic printing machine, of a carriage, a lamp carried thereby, a disk journaled on said carriage and having variable light apertures adapted to be brought in range with said lamp, a ratchet mechanism carried by said carriage and adapted to turn said disk, a rack and pinion adapted for moving said carriage, means for indicating the position of said carriage, and means for fixing the position of said carriage.

21. The combination, in a photographic printing machine, of a lamp, a journaled device having variable light apertures adapted to be brought in range with said lamp, indicating mechanism comprising a revoluble device having indicia corresponding to said apertures and means whereby said dial and indicating mechanism are operated together.

22. The combination, in a photographic printing machine, of a lamp, a journaled device having light apertures of different areas adapted to be brought into range with said lamp, a dial having indicia corresponding to said apertures, mechanism connecting said dial and device to effect their synchronous operation, and a handle for operating said device and dial together.

In testimony whereof I have hereunto set my name this 18th day of August, 1914, in the presence of the subscribing witnesses.

J. TESSIER.

Witnesses:
Jos. G. DENNY, Jr.,
K. H. HUSTON.

664

F. W. HOCHSTETTER.

APPARATUS FOR PRINTING AND PRODUCING MOVING PICTURES.

APPLICATION FILED JULY 17, 1916. RENEWED APR. 11, 1919.

1,325,198.

Patented Dec. 16, 1919.

2 SHEETS—SHEET 1.

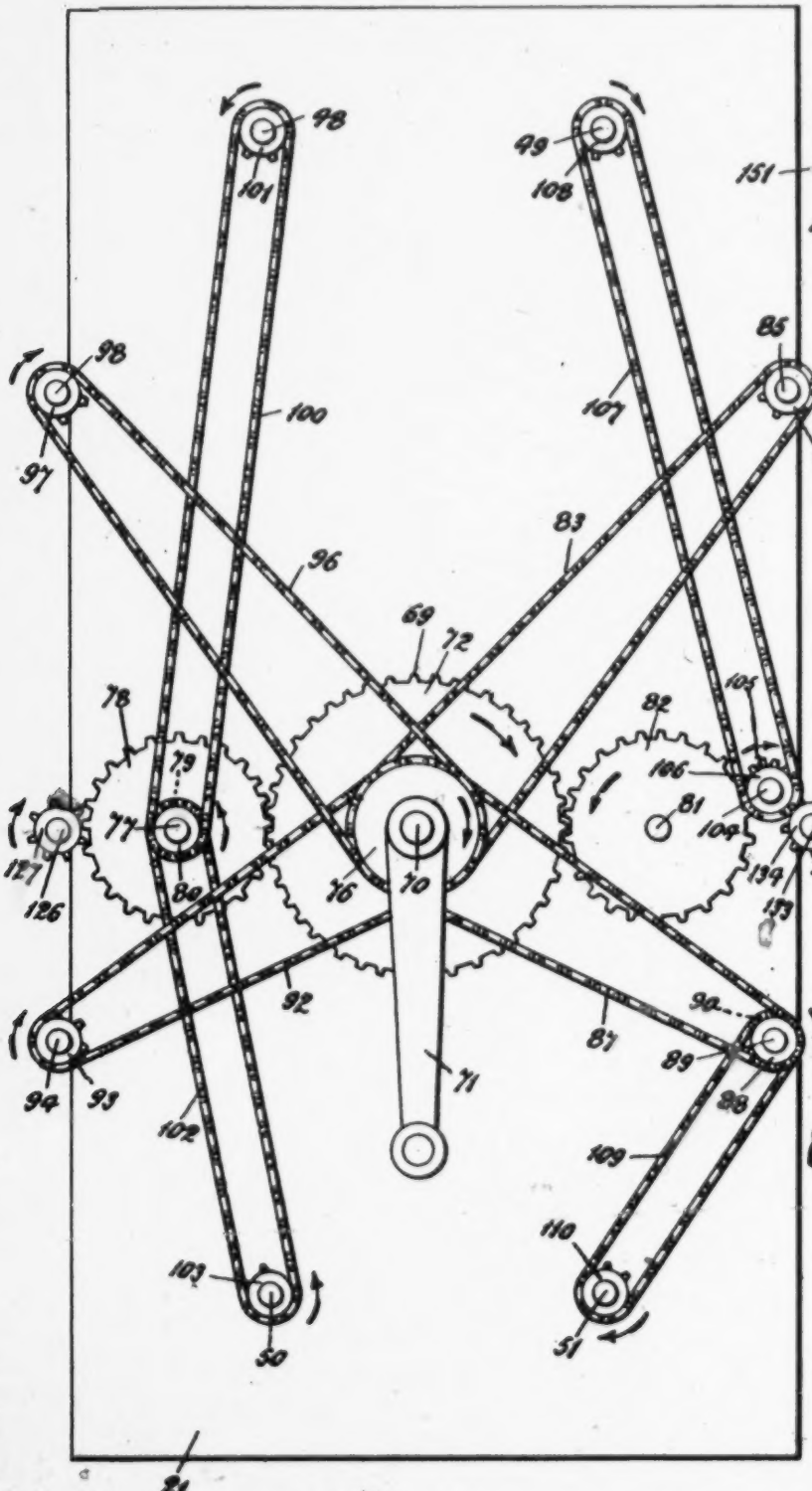

Fig. 1

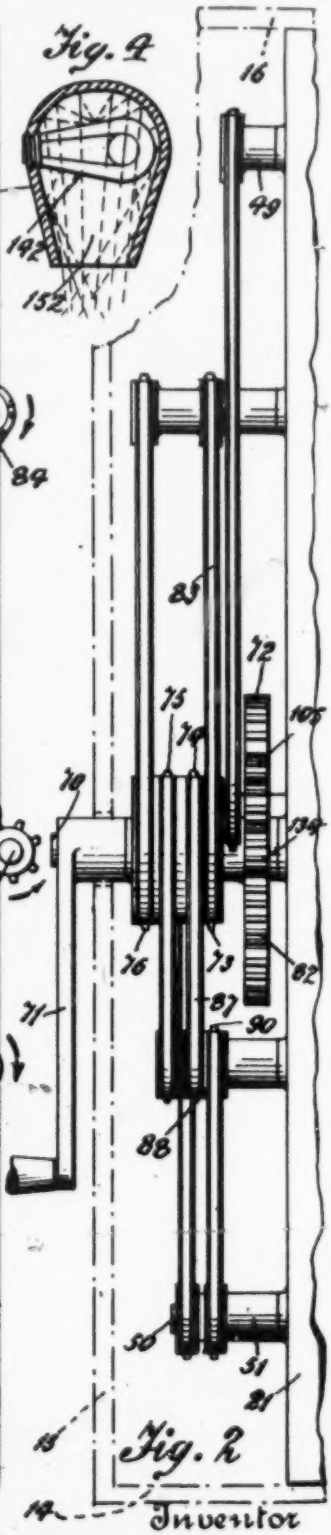

Fig. 2

Fig. 4

Inventor

Frederick W. Hochstetter

By his Attorney

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F. W. HOCHSTETTER.

665

APPARATUS FOR PRINTING AND PRODUCING MOVING PICTURES.

APPLICATION FILED JULY 17, 1916. RENEWED APR. 11, 1919.

1,325,198.

Patented Dec. 16, 1919.

2 SHEETS—SHEET 2.

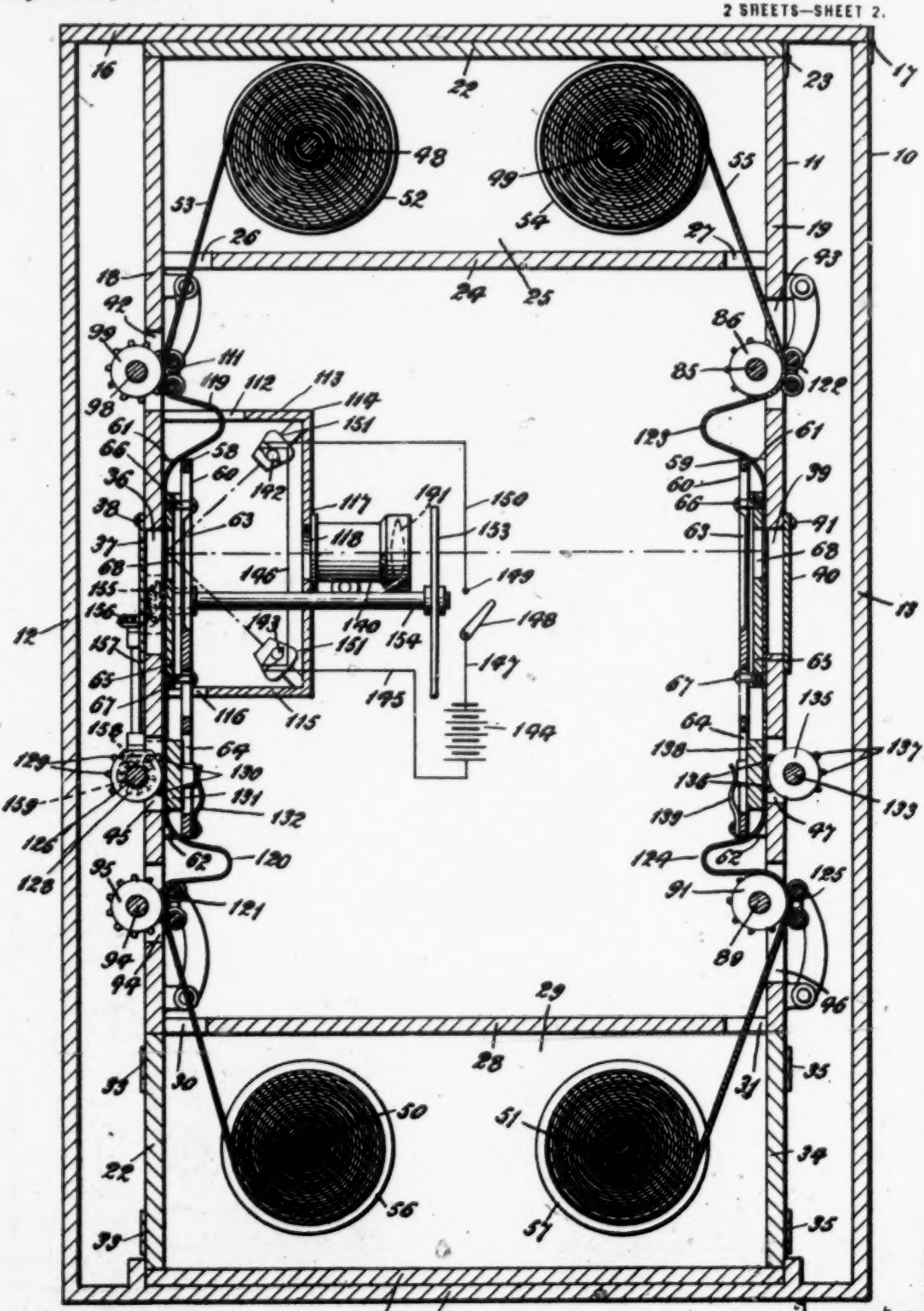

Fig. 3

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By his Attorney

H. T. Criswell

UNITED STATES PATENT OFFICE.

FREDERICK W. HOCHSTETTER, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO PAUL M. PIERSON, OF SCARBOROUGH-ON-THE-HUDSON, NEW YORK.

APPARATUS FOR PRINTING AND PRODUCING MOVING PICTURES.

1,325,198. Specification of Letters Patent. Patented Dec. 16, 1919.

Application filed July 17, 1916, Serial No. 109,831. Renewed April 11, 1919. Serial No. 289,409.

To all whom it may concern:

Be it known that I, FREDERICK W. HOCHSTETTER, a citizen of the United States, and a resident of New York, county and State of New York, have invented a certain new and useful Apparatus for Printing and Producing Moving Pictures, of which the following is a full, clear, and exact specification.

This invention relates to a class of apparatus for providing animated pictures of objects.

My invention has for its object primarily to provide an apparatus whereby moving pictures of living objects, scenery and the like may be printed and produced on an opaque strip, such as paper, or other flexible material of a character ordinarily classed as being non-combustible, in order to permit various pictures for educational, amusement and other purposes to be produced for exhibition in places of instruction and pleasure as well as in homes without endangering the auditors to fire as is incident to the use of the usual very inflammable transparent films, though in instances moving pictures may be printed and produced on transparent films by the use of this process. This is accomplished mainly by providing a process consisting of exposing a sensitized photographic strip to an opaque photographic negative strip synchronously with operative rays of light being reflected on the negative whereby the pictures on the negative will be produced on the sensitized strip to produce a positive, or by exposing a sensitized photographic strip to a positive at the same time reflecting rays of light on the positive whereby the pictures of the positive will be recorded thereon to produce a negative, then subsequently exposing a sensitized photographic strip to the photographic negative simultaneously with operative rays of light being reflected on the negative so that the pictures on the negative will be produced on the sensitized strip to produce a positive.

A practical embodiment is represented in the accompanying drawing forming a part of this specification in which similar characters of reference indicate corresponding parts in all the views the said invention being more fully described hereinafter, and then pointed out in the claims at the end of the description.

In the drawing: Figure 1 is a side elevation of one form of apparatus embodying my invention.

Fig. 2 is a fragmentary view showing partly in detail a side view of the parts of the apparatus illustrated in Fig. 1.

Fig. 3 is a sectional view, partly in detail, taken through the apparatus, and

Fig. 4 is a section, partly in detail, taken through one of the reflectors used in the apparatus.

The apparatus may be constructed of an outer casing 10 and a removable inner casing 11, both of which may be of any desired size as well as being made of any suitable material. The outer casing 10 is preferably substantially rectangular in shape to provide side walls 12 and 13, a bottom 14, a front wall 15, a rear wall, not shown, and a top 16 which is hinged, at 17, to one of the side walls for opening and closing the upper end of the outer casing, this casing being made so that light will be prevented from entering thereinto.

The inner casing 11 is also preferably substantially rectangular in shape, and this casing is of a height so as to fit closely between the bottom 14 and the top 16 of the outer casing, while the width and length of the inner casing, is smaller than the outer casing, as shown, to provide spaces between the sides and fronts of both of the casings. The inner casing is constructed with side walls 18 and 19, a bottom 20, a front wall 21, and a rear wall, not shown, while the top, as 22, is hinged, at 23, to one of the side walls to permit the upper end of the casing to be opened and closed. Transversely of the interior of the casing, and spaced from its hinged top 22, is a partition 24 to provide an upper magazine 25 in the inner casing, and through this partition adjacent to its side walls are openings 26 and 27. Also in the interior of the inner casing, and spaced from its bottom 20, is a second transverse partition 28 to provide a lower magazine 29, and through this partition adjacent to its side walls are openings 30 and 31. Entrance is gained into the lower magazine of the inner casing by a door 32 hinged, at 33, to the side wall 18 of the inner casing as well as by a second door 34 which is hinged, at 35, to the side wall 19 of the casing. Through the central part of the side wall 18 of the inner casing is an opening 36 the

opened and closed by a swinging plate 37 which is pivoted, at 38, on the exterior of this side wall, and through the central part of the side wall 19 of the inner casing is an opening 39 adapted to be closed and opened by a swinging plate 40 pivoted, at 41, on the exterior of this side wall. Also through the side wall 18 of the inner casing above the opening 36 is an opening 42 in register with an opening 43 in the side wall 19 of the casing. Through the lower part of the side wall 18 between its opening 36 and the transverse partition 28 are two spaced openings 44 and 45, while through the lower part of the side wall 19 between its opening 39 and the transverse partition 28 are also two spaced openings 46 and 47 each of which is in register with each of the openings 44 and 45.

Journaled in the front and rear walls of the inner casing 11 are two spaced shafts 48 and 49 extending through the magazine 25 of the casing, and these shafts are of lengths so that one of the corresponding ends thereof extend beyond the front wall 21 of the casing. In the front and rear walls of the inner casing 11, and projecting through the magazine 29 are two other spaced shafts 50 and 51 also of lengths so that one of their corresponding ends extend beyond the front wall of the casing. Removably held on the shaft 48 is a delivery reel 52 having wrapped thereon a film, or strip, as 53, of paper, or other opaque material which is ordinarily considered as being non-combustible, and removably held on the shaft 49 is a second delivery reel 54 having wrapped thereon a film or strip, as 55, which may also be of transparent material, or this strip may also be of paper, or other opaque material of a character usually considered as being non-combustible. The opaque strip 53 may be a photographic negative having any desired number of animated pictures of objects or the strip may be an opaque positive with animated pictures of objects thereon.

The strip 55 may be photographically sensitized for printing positive pictures thereon when the strip 53 is a negative, or the strip 55 may be photographically sensitized for producing a negative when the strip 53 is a positive, as will be hereinafter more fully explained. On the shaft 50 in the magazine 29 of the inner casing is removably held a reel 56 for receiving the moving picture strip 53 from the delivery reel 52, and on the shaft 51 is another removable reel 57 for receiving the moving picture strip 55 from the delivery reel 54.

When the strip 53 is threaded through the interior of the machine from the delivery reel 52 to the receiving reel 56 it is guided past the opening 36 of the side wall 18 of the inner casing 11, and when the strip 55 is likewise threaded through the interior of the machine it is guided past the opening 39 of the side wall 19 of the inner casing. To hold the moving picture strips 53 and 55 in movable contact with the side walls of the inner casing on the side wall 18 interiorly of the inner casing is a framing device, as 58, and on the side wall 19 also on the interior of the casing is another framing device 59. The framing devices 58 and 59 are of similar formations, and these devices may be of any well known, or preferred types, for example, forms of the devices illustrated, each of which is composed of a front plate 60 with right angularly extending arms 61 and 62 on its upper and lower ends, these arms of one of the front plates projecting from the inner surface of the side wall 18 of the inner casing to space the front plate from this wall before the opening 36, while the arms of the second front plate extend from the inner surface of the side wall 19 of the inner casing so as to space the front plate from the side wall 19 in front of its opening 39. Through the upper part of the front plate 60 of each of the framing devices is an opening 63, and this opening of one front plate is in register with the opening 36 of the side wall 18 of the inner casing, while the opening 63 of the other front plate is in register with the opening 39 of the side wall 19 of the inner casing. Through the lower part of the front plate 60 of each of the framing devices is an opening 64, and this opening of one front plate is in register with the opening 45 of the side wall 18 of the inner casing, while the opening 64 of the second front plate is in register with the opening 47 of the side wall 19 of the inner casing. Between the front plate 60 of each of the framing devices and its opposed side wall of the inner casing is a second plate 65 which is held to the front plate 60 of its respective device by bolts, or screws, as 66 and 67, passed through openings in the front plate to allow the second plate to be adjusted toward and from its opposed side wall of the inner casing, and through each of these adjustable second plates is a window 68, both of the windows being in register with each other as well as being in register with the openings 36 and 39 of the side walls of the inner casing and in register with the openings 63 of the front plate 60. The moving picture strip 53 is movably disposed between the adjustable plate 65 of the framing device 58 and the side wall 18 of the inner casing, and the strip 55 is likewise movably arranged between the adjustable plate 65 of the framing device 59 and the side wall 19 of the inner casing so that by employing the plates in this manner they are adapted to be adjusted for yieldingly holding the

strips 53 and 55 during their movements to expose successive parts thereof through the windows 68 and through the openings 63 of the front plates 60 of the framing devices.

In order to transmit the strips 53 and 55 in unison through the machine from the delivery reels 52 and 54 to the receiving reels 56 and 57, respectively, I provide a mechanism, as 69. The mechanism 69 is constructed of a drive shaft, or stud 70 journaled in a bearing on the central part of the front wall 21 of the inner casing 11 of the machine, and this shaft is of a length to extend beyond the front wall 15 of the outer casing 10 through an opening therein. The shaft 70 may be driven by any suitable power, such as a crank handle 71 provided on the end of the shaft exteriorly of the outer casing of the machine. On the shaft 70 adjacent to the front wall 21 of the inner casing is a drive gear 72, and also on this shaft between the drive gear and the front wall of the outer casing are four sprocket wheels 73, 74, 75, 76. Extending from the front plate 21 of the inner casing on alinement with the shaft 70, and in proximity to the side wall 18 of the inner casing, is journaled a stud 77 with an idler gear 78 held thereon, and this gear is in mesh with the drive gear 72. Also held on the stud 77 are two spaced sprocket wheels 79 and 80. Projecting from the front plate 21 of the inner casing on alinement with the shaft 70, and contiguous to the side wall 19 of the inner casing, is journaled a stud 81 with another idler gear 82 held thereon, and this idler gear is in mesh with the drive gear 72. Over the sprocket wheel 73 of the shaft 70 is guided a sprocket chain 83 which passes over a sprocket wheel 84 held on a shaft 85 which is journaled to the upper part of the side wall 19 interiorly of the inner casing, and on the shaft 85 is a sprocket, or toothed drum 86 adapted to be rotated in the opening 43 of the side wall 19 of the inner casing for engaging the usual apertures, not shown, provided in the strip 55. Over the sprocket wheel 74 of the shaft 70 is guided a sprocket chain 87 which passes over a sprocket wheel 88 held on a shaft 89 journaled in the lower part of the side wall 19 interiorly of the inner casing, and on this shaft adjacent to the sprocket wheel 88 is another sprocket wheel 90, while on the central part of the shaft 89 is a sprocket, or toothed drum 91 adapted to be rotated in the opening 46 for engaging the apertures of the strip 55. Guided over the sprocket wheel 75 of the shaft 70 is a sprocket chain 92 passing also over a sprocket wheel 93 held on a shaft 94 journaled on the lower part of the side wall 18 exteriorly of the inner casing, and on the shaft 94 is a sprocket, or toothed drum 95 which is arranged so as to be rotated in the opening 44 of the side wall of the inner casing to engage the usual apertures, not shown, of the strip 53. Over the sprocket wheel 76 of the shaft 70 is guided a sprocket chain 96 passing over a sprocket wheel 97 held on a shaft 98 which is journaled on the upper part of the side wall 18 exteriorly of the inner casing, and on this shaft is a sprocket, or toothed drum 99 rotatably disposed in the opening 42 of the side wall 18 of the inner casing so as to also engage the apertures of the strip 53. On the sprocket wheel 80 of the stud 77 is a sprocket chain 100 which is guided over a sprocket wheel 101 provided on the shaft 48 of the delivery reel 52 exteriorly of the front wall of the inner casing of the machine, and on the sprocket wheel 79 of the stud 77 is a sprocket chain 102 passing over a sprocket 103 arranged on the shaft 50 of the receiving reel exteriorly of the inner casing. On the front wall 21 of the inner casing of the machine adjacent to its side wall 19 is journaled a stud 104 having a pinion 105 held thereon, and this pinion is in mesh with the gear 82 on the stud 81. Also on the stud 104 is held a sprocket wheel 106 on which is a sprocket chain 107 passing over a sprocket wheel 108 on the shaft 49 of the delivery reel 54 exteriorly of the front wall 21 of the inner casing. Over the sprocket wheel 90 of the stud 89 is a sprocket chain 109 which is guided over a sprocket wheel 110 provided on the shaft 51 of the receiving reel 57 exteriorly of the inner casing. By properly proportioning the diameters of the drive gear 72, gears, 78, 82, sprocket wheels 73, 74, 75, 76, as well as the sprocket wheels 79, 80, 93, 97, 84, 88, 90, 93, 97, 101, 103, 106, 108, 110, and also the pinion 105 with relation to each other the studs 77, 81, and the shafts 85, 89, 94, 98 with the shafts 48, 49, 50, 51 will through the driving of the sprocket chains 83, 87, 92, 96, 100, 102, 107, 109 be caused to be driven in unison at corresponding speeds for revolving the toothed drums 84, 88, 94, 97 to transmit the strips 53 and 55 also in unison through the machine.

When the motion picture strip 53 is threaded through the machine it is guided from the delivery reel 52 through the opening 20 of the transverse partition 24 of the inner casing 11, and the strip is moved into engagement with the toothed drum 99 to which it is held in movable contact by compression rollers, as 111, of well known forms arranged on the side wall 18 interiorly of the inner casing. The strip is then passed through an opening 112 in the top wall 113 of a casing, or box, as 114, which extends interiorly of the inner casing of the machine before the registered windows 63 and 68 of the framing device 58, the box being formed with a bottom wall 115 having an opening

116 and a front wall 117 with an opening 118 therethrough which is in register with the windows 63 and 68 of the framing device 58. A loop, as 119, is formed in the strip 53 at the opening 112 of the box 114, and the strip is guided between the side wall 18 of the inner casing 11 and the adjustable plate 65 of the framing device 58 for being transmitted before the windows 63 and 68 of this framing device as well as before the opening 118 of the front wall 117 of the box 114. From the framing device 58 the strip 53 is passed through the opening 116 of the bottom wall of the box 114, and after a second loop 120 is formed in the strip it is guided into engagement with the sprocket drum 95, the strip being held in movable contact with this sprocket drum by compression rollers, as 121, provided on the side wall 18 of the inner casing of the machine. The strip is then passed through the opening 30 of the transverse partition 28 of the inner casing 21 for being wrapped on the receiving reel 56 during the transmission of the strip through the machine.

When the motion picture strip 55 is threaded through the machine it is guided from the delivery reel 54 through the opening 27 of the transverse partition 24 of the inner casing 11, and the strip is moved into engagement with the toothed drum 86 to which it is held in movable contact by compression rollers, as 122, of well known types provided on the side wall 19 of the inner casing. A loop, as 123, is then formed in the strip 55 after which the strip is arranged between the side wall 19 of the inner casing and the adjustable plate 65 of the framing device 59. A second loop, as 124, is then formed in the strip which is guided into engagement with the sprocket drum 91, and the strip is held in movable contact with this sprocket drum by a pair of compression rollers, as 125, arranged on the exterior of the side wall 19 of the inner casing. From the sprocket drum 91 the strip is passed through an opening 31 in the transverse partition 28 of the inner casing for being wrapped on the receiving reel 57 during the transmission of the strip through the machine.

In order to cause the strips 53 and 55 to be intermittently checked during the transmission through the machine, on the exterior of the wall 18 of the inner casing 11 of the machine is journaled a shaft 126 one end of which extends beyond the front wall 21 of the inner casing, and on this extending end of the shaft is a pinion 127 which is in mesh with the gear 78 of the stud 77. Also on the shaft 126 is a drum 128 disposed in the opening 45 of the side wall 18 of the inner casing, and extending from diametrically opposite parts of this drum are sets of spaced teeth, as 129 and 130, adapted to engage the apertures of the moving picture strip, the strip being held in movable contact with the toothed drum by a block, as 131, which is yieldingly forced inwardly of the opening 64 of the front plate 60 of the framing device 58 so as to abut against the strip to hold it in engagement with the toothed drum by a spring, as 132, arranged on the front plate of this framing device. On the exterior of the side wall 19 of the inner casing of the machine is journaled a shaft 133 one end of which extends beyond the front wall 21 of the inner casing, and on this end of the shaft is a pinion 134 meshing with the pinion 105 of the stud 104. On the shaft 133 and disposed in the opening 47 of the side wall 19 of the casing is a drum 135 having spaced sets of teeth 136 and 137 projecting from diametrically opposite parts thereof, and which engage the apertures of the moving picture strip 55, this strip being held in movable contact with the toothed drum by a block, as 138, yieldingly forced inwardly of the opening 64 of the front plate 60 of the framing device 59 so as to contact with the strip to hold it in engagement with the toothed drum 135 by means of a spring, as 139, provided on the front plate of the framing device 59. The pinions 127 and 134 are proportioned so that when the other parts of the mechanism 69 are operated, as above mentioned, the shafts 126 and 133 will be driven at speeds corresponding to the other shafts and studs of the mechanism, and the drums 128 and 135 are also proportioned together with the sets of teeth of each drum being relatively spaced apart that the movement of the strips 53 and 54 when transmitted through the machine will be intermittently checked synchronously so that corresponding successive portions of both strips will be exposed in unison to each other through the registered windows and openings 63 and 68 of the framing devices 58 and 59 as well as through the opening 118 of the box 114 interiorly of the inner casing. While specific forms of the intermittent checking devices are shown and described, instead thereof I may employ any other well-known, or preferred types of devices for causing the strips to be intermittently checked during their transmission through the machine. On the front wall 117 of the box 114 interiorly of the inner casing of the machine is a lens barrel 140 with one or more lenses, as 141, mounted therein, and this barrel is arranged so that the focus of the lens will be in the path of the successive parts of the moving picture strips exposed through the registered windows and openings 63 and 68 of the framing devices 58 and 59 as well as through the opening 118 of the box 114.

Interiorly of the lens box 114 of the inner casing are arranged one, or a plurality of lamps, as 142 and 143, which are preferably electrically lighted from any suitable source

of supply, for example from a battery, as 144, from one terminal of which is a wire 145 leading to one pole of one of the lamps, and the corresponding second poles of the lamps are connected by a wire 146. From the second termin of the battery 144 is a wire 147 leading to a switch 148 adapted to be swung into engagement with a contact 149 of a wire 150 leading to the other pole of the second electric lamp so that by swinging the switch 148 into engagement with the contact 149 the lamps will be lighted by the circuit being closed, the current passing from the battery over the wire 145 to one of the lamps, through which the current will pass over the wire 146, and also from the battery the current will pass over the wire 147, through the switch 148, and over the wire 150 to and through the second electric lamp, the light from these lamps being extinguished by disconnecting the switch 148 from the contact 149. Each of the lamps 142 and 143 is mounted in a reflector, as 151, which may be parabolic, or pear-shaped, as shown, in the form of a mirror, or the reflector may be of metal having an interior reflecting surface for deflecting the rays of light from its lamp through the opening, as 152, of the reflector. One of the reflectors is arranged in the upper part of the box 114, while the other reflector is mounted in the lower part of the box, and these reflectors are disposed in converging arrangement so that the rays of the lamps will be deflected on the portions of the strip 53 exposed through the registered windows 63 and 68 of the framing device 58. The exposures of the strip 53 to the lens 141 will thereby be effected by the reflected rays of light from these lamps.

To cut-off at intervals the light deflected on the exposures of the strip 53 when transmitted through the machine, a shutter, as 153, of any desired form may be provided. The shutter 153 is disposed interiorly of the inner casing for being revolved across the plane of the focus of the lens 141, and this shutter is held on one end of a shaft 154 journaled in the side wall 18 of the inner casing 11 so that the usual spaced blades of the shutter will when rotated cut-off the light deflected on the strip 53. The second end of the shaft 154 extends through an opening in the side wall 18 of the inner casing some distance beyond this side wall, and on this second end of the shaft is a bevel gear 155 in mesh with a bevel gear 156 on the upper part of a vertically disposed shaft 157 which is journaled in bearings on the exterior of the side wall 18 of the inner casing. On the lower end of the shaft 157 is another bevel gear 158 meshing with a bevel gear 159 provided on the shaft 126 of the toothed drum, or intermittent operating device 128, and these bevel gears of the shutter are proportioned so as to be operated when the shaft 126 is driven for cutting-off the light on the strip 53 at proper intervals as is incident with customary methods for shutting-off the light in operating the usual moving picture machines.

In order to print the moving pictures of a photographic opaque negative strip on a sensitized opaque photographic strip, or on a sensitized transparent photographic strip to produce a positive the negative is wrapped on the delivery reel 52, and the sensitized strip is threaded in the machine, as above explained, for transmission to the receiving reel 56 so that successive portions of the negative strip will be exposed through the windows 63 and 68 of the framing device 58. The sensitized strip 55 is wrapped on the delivery reel 54, and this strip is then threaded through the machine, as also above explained, for transmission to the receiving reel 57 so that corresponding successive portions of the strip will be exposed through the windows 63 and 68 of the framing device 59 to the lens 141 for being focused through the opening 118 of the box 114, and through the windows 63 and 68 of the framing device 58 to the sensitized positive. Simultaneously with the focusing of the pictures of the negative the light from the lamps 142 and 143 is deflected by the reflectors 151 on the exposures of the negative strip 53, and the pictures will thereby be printed on the sensitized strip 54 to produce a positive when the machine is operated.

To produce a photographic opaque negative, or a photographic transparent negative of the pictures of an opaque positive strip, the positive strip is wrapped on the delivery reel 52, and the positive is arranged in the machine, as hereinbefore explained, for transmission to the receiving reel 56 so that successive portions of the positive will be exposed through the windows 63 and 68 of the framing device 58 to the lens. A sensitized photographic strip for producing a negative is wrapped on the delivery reel 54, and the strip 55 is threaded through the machine, as described, so as to be transmitted to the receiving reel 57. When the machine is operated the successive pictures of the positive exposed to the lens 141 will by employing the light of the lamps, as above described, be focused on the sensitized strip, 55 for recording the pictures thereon which are afterward converted to a photographic negative in the usual manner.

To print the pictures of this photographic negative when the strip is opaque on a sensitized opaque strip, or on a transparent photographic sensitized strip, to produce a positive, the negative strip 53 is wrapped on the delivery reel 52, and the strip is threaded in the machine, as explained, for transmission to the receiving reel 56 so that consecutive

portions of the negative will be exposed through the windows 63 and 68 of the framing device 58. The sensitized strip 55 is wrapped on the delivery reel 54, and this strip is then threaded through the machine, as described, for being transmitted to the receiving reel 57 in unison with the negative strip 53 so that consecutive portions of the strip will be exposed through the windows 63 and 68 of the framing device 59. When the negative strip 53 and the sensitized strip 55 are transmitted through the machine, and when the light of the lamps 142 and 143 are reflected on the negative strip 53, the pictures of this negative will be focused by the lens 141 on the successive exposures of the sensitized strip to produce a positive of the pictures when the strip is developed in the customary manner. By this process moving pictures may be readily printed from an opaque negative strip on an opaque, or transparent sensitized strip to produce positive pictures of the negative, or moving pictures may be reproduced from an opaque positive strip to an opaque, or transparent sensitized strip to produce a negative and then printed on a sensitized strip to produce a positive. Moreover, by employing a suitable lens the pictures may be enlarged or reduced in sizes, as occasion requires.

To operate the machine following the proper arrangement of the moving picture strip in the machine, the crank handle 71 is turned for revolving the shaft 70, and the drive gear 72 with the sprocket wheels 73, 74, 75, 76 will be revolved. The gears 78 and 82 will then be rotated in opposite directions. The rotation of the gear 78 will drive the sprocket chains 92, 96, 100, 102 for driving the shafts 94, 98, 126, 48, 50 to rotate the sprocket wheels 93, 97, 101, 103 with the pinion 127, drum 128, and toothed drums 95 and 99 to intermittently transmit the strip 53 from the delivery reel 52 to the receiving reel 56, the shutter 153 being operated in unison with these parts, as hereinbefore explained. Simultaneously with the rotation of the sprocket wheels 73, 74, 75, 76 the sprocket chains 83 and 87 will be driven to rotate the sprocket wheel 84, shaft 85, toothed drum 86, sprocket wheels 88, 90, shaft 89, toothed drum 91, sprocket chain 109, sprocket wheel 110 and shaft 51 of the receiving reel 57, and with the rotation of the gear 82, the pinion 105, sprocket wheel 106, shaft 104, pinion 134, shaft 133, drum 135, sprocket chain 107, sprocket wheel 108, and the shaft 49 will be operated to intermittently transmit the strip 55 from the delivery reel 54 to the receiving reel 57. By previously closing the electric circuit to the lamps 140 and 142, as above explained, the light from the lamps will be deflected by the reflectors on the strip 53 during the operation of the machine, and while a specific form of machine is herein illustrated and described, I may employ any other suitable apparatus separately or collectively for practising my process.

In the foregoing description, I have embodied the preferred form of my invention, but I do not wish to be understood as limiting myself thereto, as I am aware that modifications may be made therein, without departing from the principle, or sacrificing any of the advantages of this invention, therefore I reserve to myself the right to make such changes as fairly fall within the scope thereof.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In an apparatus for printing and producing moving pictures, a light-proof casing, a second casing within the light-proof casing, having two spaced registered exposure windows, a chamber within the second casing, a lens on the chamber arranged so that its axis coincides with the center of the exposure windows, light emitting means in said chamber for projecting light in one of the windows, means for intermittently transmitting two photographic strips in synchronism before both of said exposure windows, and means for cutting-off at intervals the light focused by the lens.

2. In an apparatus for printing and producing moving pictures, a light-proof casing, a second casing removably arranged in the light-proof casing, having two spaced registered exposure windows, a chamber within the second casing, a lens on the chamber arranged so that its axis coincides with the center of the exposure windows, light emitting means in said chamber for projecting light in one of the windows, and means for intermittently transmitting two photographic strips in synchronism before said windows.

3. In an apparatus for printing and producing moving pictures, a light-proof casing, a second casing within the light-proof casing and having two spaced registered exposure windows, a chamber within said second casing adjacent one exposure window, a lens on the chamber between said windows arranged so that its axis substantially coincides with the center of the exposure windows, light emitting means in said chamber for projecting light in the adjacent window, means for intermittently transmitting two photographic strips in synchronism before said windows within said second casing, means for cutting off at intervals the light focused by the lens, the strip transmitting means and the light cut-off means including interconnected gearing supported by said second casing within the light-proof casing, and means outside of said light-proof casing for operating said gearing.

4. In an apparatus for printing and producing moving pictures, a casing having two spaced registered exposure windows, a chamber within said casing adjacent one exposure window, a lens on the chamber between said windows arranged so that its axis substantially coincides with the center of the exposure windows, light-emitting means in said chamber for projecting light in the adjacent window, partitions within the upper and lower portions of said casing forming upper and lower reel receiving chambers, a pair of reels within each of said reel receiving chambers for two photographic strips, and means supported by the casing and operatively associated with said reels and said strips for intermittently transmitting the latter in synchronism before said windows.

5. In an apparatus for printing and producing moving pictures, a box-like light-proof casing having an openable top wall, a second smaller box-like casing within the light-proof casing having registered exposure windows in the opposite side walls thereof, and provided with an openable top wall, framing devices for said windows mounted on said side walls, photographic strip loop forming and feeding means mounted on each of said side walls, a lens mounted within said second casing in alinement with and between said windows, light emitting means in said second casing to project light in one of said windows, transverse horizontal partitions in the second casing providing upper and lower reel-receiving chambers therein, doors for the lower reel-receiving chamber in said side walls, and means to operate said loop forming and feeding means to transmit the photographic strips in synchronism before said windows.

This specification signed and witnessed this 15th day of July A. D. 1916.

FREDERICK W. HOCHSTETTER.

Witnesses:
GEORGE F. BENTLEY,
C. SHIEGLEY.

673

A. F. JOBKE.

COPYING CAMERA.

APPLICATION FILED MAY 8, 1919.

1,344,896.

Patented June 29, 1920.

2 SHEETS—SHEET 1.

Fig. 1.

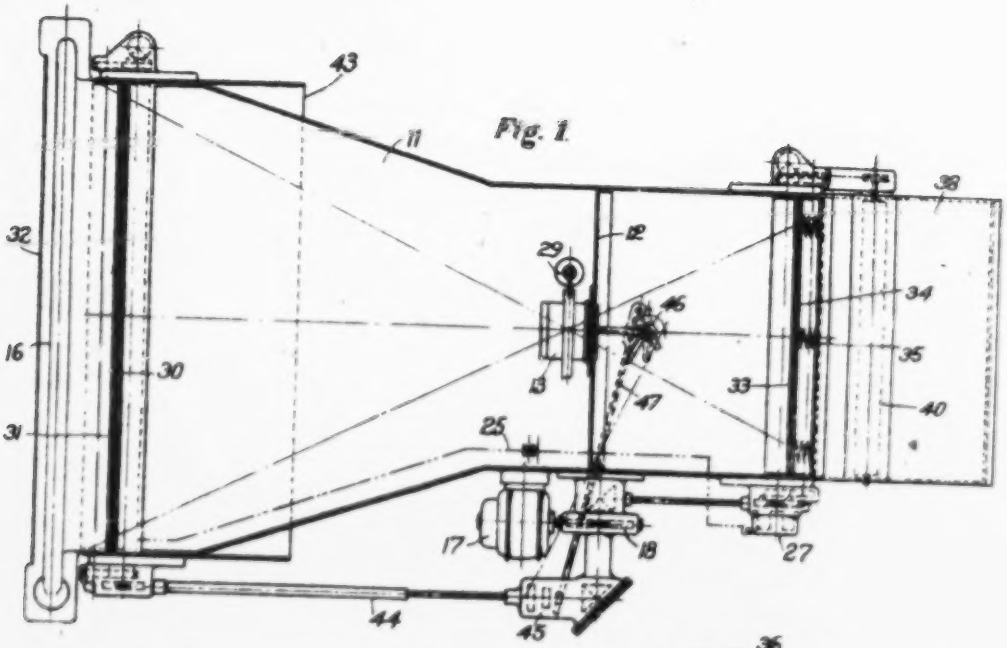

Fig. 2.

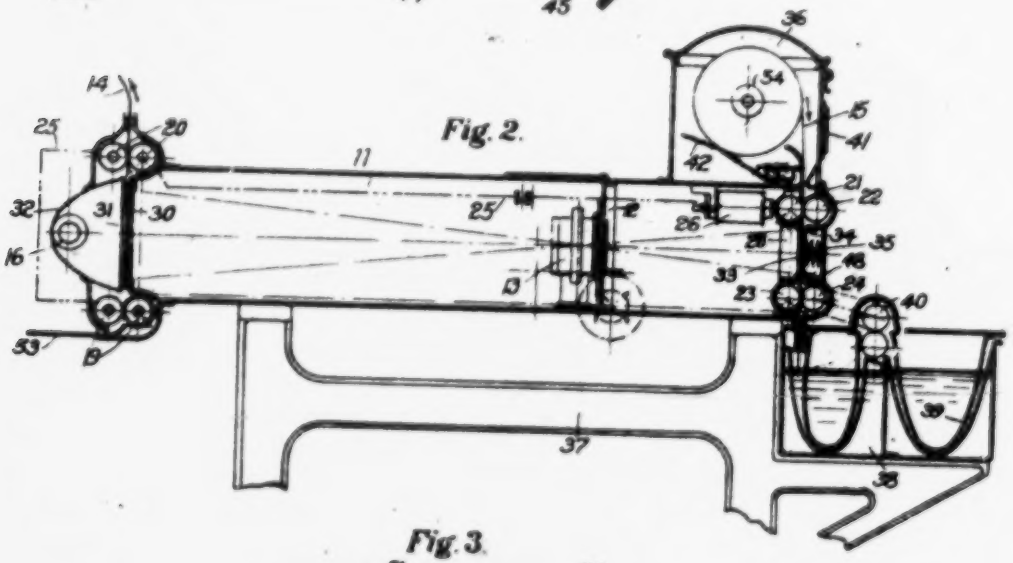

Fig. 3.

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2 SHEETS—SHEET 2.

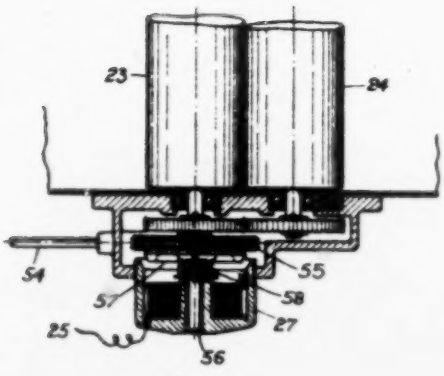

Fig. 4

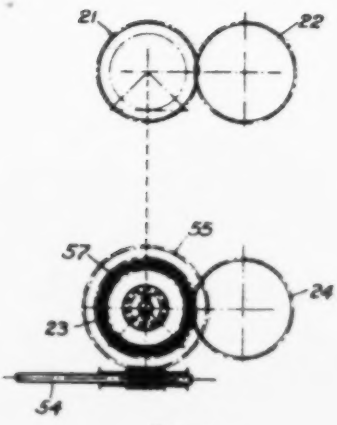

Fig. 5

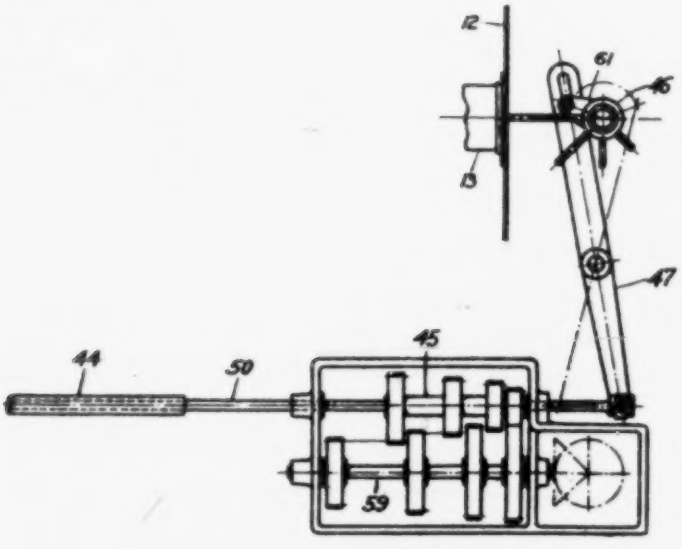

Fig. 6

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UNITED STATES PATENT OFFICE.

AUGUST F. JOSEK, OF DETROIT, MICHIGAN.

COPYING-CAMERA.

1,344,896. Specification of Letters Patent. Patented June 29, 1920.

Application filed May 8, 1919. Serial No. 296,234.

To all whom it may concern:

Be it known that I, AUGUST F. JOSEK, a citizen of the United States, residing at Detroit, Wayne county, in the State of Michigan, have invented certain new and useful Improvements in Copying-Cameras, of which the following is a specification.

My invention relates particularly to photographic apparatus useful in the reproduction of graphic records, as required in the various branches of engineering,—for example, prints from tracings on linen or transparent paper in the same size or on a reduced scale, and its purpose is the provision of continuous operation, so as to make full use of the light provided and to produce a larger output during the same length of time than other arrangements could make possible. The continuous operation enables also the production of copies of unlimited length, thereby avoiding the cumbersome joining together with adhesive of the limited lengths of pieces, as is the practice now where long plans of buildings or industrial plants and the like, are to be reproduced. A similar advantage will also be found in the copying of panoramic films and similar objects.

The operation of this invention is based on the following well known principle in photography: If a camera is sharply focused on a subject moving parallel to the screen, *i. e.* normal to the principal ray of light, the image produced thereby moves in an opposite direction with a velocity proportionate to the conjugate focal distances. Replacing the screen with a sensitized medium and moving the latter during the exposure with the velocity of the image, renders the same immovable relative to the copying medium and therefore a full exposure can be accomplished through the continuously traveling image. This enables in a suitable arrangement, to develop and fix the impression on the copying medium in the same succession on one part, while another is still being exposed. The length of the original to be copied is thereby not limited in the direction of the movement and it affects only the time of operation.

In the accompanying drawings an illustration is given of an arrangement, which embodies the parts and combination of my invention, and Figure 1 therein shows a horizontal section through the apparatus, arranged for the reproduction at various ratios of reduction, while Fig. 2, represents a vertical section through the same, but arranged for one ratio of reduction. Fig. 3 illustrates the arrangement of a cutter of the sensitized medium on which an exposure has been made. Fig. 4 illustrates the arrangement of the drive for the rolls conveying the copying medium, and a magnetic clutch to disengage the rolls from the moving drive, while Fig. 5 shows an axial view of the conical clutch-disk and diagrammatically a worm and gear drive to operate the four rolls simultaneously. Fig. 6 shows in detail the connecting apparatus between a change-gear drive and the stops determining the position of the lens-board, to enable different ratios of reduction.

A dark chamber or camera (11) is partitioned, light-proof, in two parts by a lens-board (12) in whose center a photographic lens (13) preferably an anastigmat of large aperture is mounted. The optical center of this lens is located between the planes of contact of two sets of friction rolls on each end of the camera (11) so that their distances from the lens have the ratio of conjugate focal distances for a predetermined factor of reduction, either to the same size or one differing therefrom. A transparent drawing (14) moving in the direction of the arrow in front of a light source (16) will therefore produce a stationary image on the sensitive paper (15), traveling in the direction of the indicating arrow. A motor (17) connected to the source which also furnishes the light, drives through a worm and gearing train (18) the two sets of friction rolls at their proper speeds. The pair of friction rolls (19) driven direct from the gear train (18) is supposed to have a tight grip on the drawing to be fed from the guide (32) into the machine, while the second pair (20) may have an elastic grip on the same, permitting a slip at a certain tension. With a gear ratio of one tooth higher at 20 than at 19, the drawing will always be straight and passing the light under a certain tension. A similar arrangement may be made with the rolls 21 to 24, inclusive, the rolls 23 and 24 having the lesser grip and the higher speed.

While with this arrangement a slip takes place between the one set of rolls and the passing medium, a slip can also be produced in a small friction clutch interposed between the friction rolls and their driving gears.

This arrangement may be found preferable since it does not impose any wear on the drawings to be copied.

In order not to waste any of the sensitive paper (15), I have arranged to control its feed through the tracing (14), since the operator may forget or not be able to oversee the control of the feed. I accomplish this by mounting the rollers 21 and 23 in a frame (28) which is slightly movable, so that the friction on the paper (15) can be removed and the latter come to a standstill with turning rolls. The control of the necessary movement is obtained with an electromagnet (26) which is in series connected with the rolls 19 and 20 in a circuit (25), either fed from the main circuit furnishing all the power, or, preferably, from a few battery cells having a low voltage, thereby avoiding the dangers of grounding or high voltage across the thickness of the tracing (14). This circuit can be operated with the main switch. It can be seen now, that when there is no tracing in the sets of rolls 19 or 20, the circuit through the magnet (26) is closed; therefore, rolls 21 and 23 do not propel the paper (15). But after a tracing has entered rolls (19) or is passing across rolls 20, the circuit is interrupted and rolls 21 and 23 exert their pressure upon paper (15) and move it along.

The arrangement with electromagnet (26) is one of several to be used, and I therefore would not restrict myself to the same. Another alternative would be to arrange a pot-magnet (27) as in Fig. 1, in connection with a positive or a friction clutch to release the same and thereby prevent the rollers 21 to 24 inclusive, from turning, when the circuit through the magnet is closed. This arrangement is shown in more detail in Fig. 4, where a worm on shaft (54) transmits its motion from the driving gear to a worm-gear (55), running loosely on the roller-shaft (56), which preferably extends through the pot-magnet (27) frictionless, in order to prevent an axial magnetic pull on the same. (57) is a magnetic friction-cone disk, which fits into a recess of the same angularity in the worm-gear and slides on a key in the shaft (56). A spring (58) keeps the friction-disk and worm-gear engaged, as long as the outer pole of the electromagnet (27) does not pull the rim of the former out of contact. Therefore the drive engages the combined train of gears in Fig. 5, to move rolls (21) to (24) inclusive and thereby propel the sensitized paper with the proper speed. Fig. 5 shows the friction-disk (57) in a plane view, and diagrammatically its connection with the worm gear, and also the connection of the four rollers (21) to (24) through miter-gears. In order to keep the circuit through the rolls 19 and 20 insulated, the latter may be made of insulating material such as wood and covered by a metallic shell, as the contact medium.

For the purpose of omitting part of the reproduction, as in the case of a change being desired, an electromagnet (29) may be arranged to operate a shutter in the lens of the bulb-exposure type at the will of the operator. This will prevent the passage of light for the exposure as desired.

In order to positively guide the tracing, there are provided a clear glass plate (30) and another one, preferably matte (31), with such a distance between them, that the tracing will glide in a straight plane, but without undue friction, until taken up by the rollers (20). Their width will correspond to that of a reflector (32) so that a maximum of light passes through them.

Similarly, a clear glass plate (33) and preferably, a reflecting plate (34) of polished metal or white material, are arranged on the copying side to guide the sensitive paper (15) in a straight plane and in the exact focal distance. Springs (35) with a slight pressure may press the plate (34), and therewith the paper in its exact position. Since through a copying paper with white stock some of the light may pass, a reflector will re-direct the same and have some additional chemical action on the under side of the sensitive coating, therefore the total chemical action will be increased.

In order to accomplish a continuous process for the finishing of the reproduction, the following arrangement will now be described: The sensitive paper (15) is contained in a light-proof box (36) and with proper guides is directed through the sets of rollers 21 to 24, inclusive, between which it will have received the exposure of the drawing 14. The body of the camera is light-proof connected to the tanks (38) necessary for a continuous development and fixing, which are mounted with the camera on a common support (37). Wire guides (39) are provided, to positively guide the paper while in the solutions and to prevent the paper from sticking to the walls of the tanks through adhesion or suction. A set of rollers (40) driven from friction roller 24, serves at the same time as a propeller and a wringer, to prevent the carrying over of solution in another tank.

A drier, provided in the customary way, will complete the arrangement for the production of a complete train of finished copies on a continuous strip of copying paper.

While at 41 a window with red or orange glass is provided to permit the inspection of the copying paper, a lever (42) under the action of a spring, is arranged in a circuit adapted to disconnect the power supply, as soon as this lever, after the complete un-

rolling of the paper supply, touches the metal shell (54) of its supporting mandrel. Therefore, after the exhaustion of the paper, the machine comes to rest.

In referring now to Fig. 1, I shall describe the arrangement, which enables the production of copies at different rates of reduction.

43 denotes an open box, telescoping light-proof into the open end of the chamber 11 and carrying the guides and propelling rollers as also the light source with its reflector. Proper marks may determine the exact positions of this box to be selected to give the focal distances from the lens to the drawings to be copied. The drive shaft (44) for the roller train (19) and (20) is made telescoping on a key or spline to provide a positive drive for any position. A change gear (45) provides for the variation of speed as is required for the different ratios of reduction, while a variation of field excitation of the motor provides for speeding up of the complete drive for a higher reduction.

For the purpose of varying reduction, a shifting of the lens-carrier (12) must be provided, and I arrange the stop (46) with pegs of different lengths at different angles, as the equivalent of a cam, to limit the movement of the lens-carrier after the selected position has been obtained. A lever (47) connecting a crank at 46 with the shaft operating the change gear (45) accomplishes the selection of lens portion and corresponding speed ratio in one operation. For the convenience of illustration Fig. 6 shows the change-gear case turned 90° around shaft (44), and (59) denotes a rigidly held gear-shaft carrying a number of spur-gears, corresponding to the required number of reductions, while (45) is a set of corresponding gears on an axially sliding shaft (60). All spur-gears are spaced so that a movement for the face-width plus the necessary clearance brings another pair of gears into mesh. The lever (47) by means of collars and sliding ring, takes a corresponding angular position, which in turn, at the other end, corresponds to a different angular position of the crank 61, rigidly connected with the lens stop (46). The turning of this crank provides for the change of angular position of lever (47) and, therefore, the simultaneous adjustment of lens-stop and change-gear.

At 48 a cutter-arrangement is indicated, which permits cutting off the exposed stock, if the machine is to discontinue operation, and in Fig. 3 an arrangement is shown in a plane view from above, which may serve as an illustration of the same.

A triangular knife (49) swings around a trunnion (50), which glides in grooves serving as guides. A pin (51) preferably also guided, takes up the pull of one of the two attached strings, pulling in opposite directions. The resistance of the paper (15) against cutting and the pressure of the trunnion against the groove place the cutting edge into the right position to cut in the direction of the pulling string. When there is no pull exerted, the blade should be made to take the position as shown in dot and dash, which can simply be taken care of by a leaf-spring. Thus the cutting will be done alternately from the right and left.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:—

1. In a photographic apparatus a dark chamber with openings at the two ends for the admission and passage of light, two pairs of friction rollers at each end placed in parallel planes of contact at conjugate focal distances, a lens and lens board separating the said chamber into two light-proof compartments and means, including an electric circuit through the two pairs of friction rollers propelling the medium to be copied, to control the feed by the set of friction rollers propelling the sensitive copying medium.

2. In a photographic apparatus a dark chamber with openings at the two ends for the admission and passage of light, two pairs of friction rollers at each end placed in parallel planes of contact at conjugate focal distances, a lens and lens board separating the said chamber into two light-proof compartments and means, including an electromagnet and its circuit through the two pairs of friction-rollers propelling the medium to be copied, to control the feed by the set of friction rollers propelling the sensitive copying medium, the feed being established through the interposition of the medium to be copied between one of the corresponding pairs of friction rollers causing the release of the electromagnet.

3. In a photographic apparatus a dark chamber with openings at the two ends for the admission and passage of light, two pairs of friction rollers at each end placed in parallel planes of contact at conjugate focal distances, a lens and lens board separating the said chamber into two light-proof compartments, a friction clutch in the drive of the set of friction rollers propelling the copying medium, and means, including an electro-magnet and its circuit through the two pairs of friction rollers propelling the medium to be copied, controlling the friction clutch.

4. In a photographic apparatus a dark chamber with openings at the two ends for the admission and passage of light, two pairs of friction rollers at each end placed in parallel planes of contact at conjugate focal distances, a lens and lens board separating the said chamber into two light-proof compartments, a friction clutch in the drive of the set of friction rollers feeding the

copying medium, and means, including an electromagnet and its circuit through the two pairs of friction rollers propelling the medium to be copied, to control the said friction clutch, the feed of the copying medium being established through the interposition of the medium to be copied between one of the corresponding pairs of friction rollers.

5. In a photographic apparatus a dark chamber with two pairs of friction rollers at each end placed in parallel planes of contact, a lens board and lens adapted to separate the chamber into two light-proof compartments, providing conjugate focal distances between the said planes and a pair of guide plates placed at one end resiliently in contact with each other in one of the said planes, the guide plate nearer the lens being of transparent material and the guide plate on the outward side having a reflecting surface toward the said lens.

6. In a photographic apparatus a dark chamber with two pairs of friction rollers at each end, placed in parallel planes of contact and rotating in opposite directions, openings in the chamber between each two pairs of friction rollers for the admission and passage of light, the second pair of rollers in the direction of rotation rotating faster than the first pair and providing for less friction.

7. In a photographic apparatus a dark chamber with a movable extention at one end and two pairs of friction rollers at the end of the extension and at the opposite end of the chamber, placed in parallel planes of contact, openings in the chamber and its extension between the two pairs of rollers for the admission and passage of light, a movable lens board and lens adapted to establish variable conjugate focal distances between the said parallel planes and a mechanical drive adapted to vary the speed ratio of the two sets of friction rollers in the ratio of the adjacent conjugate focal distances.

8. In a photographic apparatus a dark chamber with a movable extension at one end and two pairs of friction rollers at the end of the extension and at the opposite end of the chamber, placed in parallel planes of contact, openings in the chamber and its extension between each two pairs of friction rollers for the admission and passage of light, a movable lens board and lens adapted to establish pre-determined variable conjugate focal distances between the said parallel planes, means to stop the said lens board in its pre-determined position, and a mechanical drive provided with a change gear arrangement to vary the speed ratio of the two sets of friction rollers in the ratio of the adjacent conjugate focal distances.

9. In a photographic apparatus a dark chamber with a movable extension at one end and two pairs of friction rollers at the end of the extension and at the opposite end of the chamber, placed in parallel planes of contact, openings in the chamber and its extension between each two pairs of friction rollers for the admission and passage of light, a movable lens board and lens adapted to establish pre-determined variable conjugate focal distances between the said parallel planes, means to arrest the said lens board in its pre-determined position, including stops of corresponding lengths rotatable radially about a central bearing, a mechanical drive provided with a change gear arrangement to vary the speed ratio with respective conjugate focal distances, and means, including a lever, for simultaneously adjusting the roller speeds and lens positions.

10. In a photographic apparatus a dark chamber with a movable extension at one end and two pairs of friction rollers at the end of the extension and at the opposite end of the chamber, placed in parallel planes of contact, openings in the chamber and its extension between each two pairs of friction rollers for the admission and passage of light, a movable lens board and lens adapted to establish predetermined variable conjugate focal distances between the said parallel planes, means to arrest the said lens board in its predetermined position, including stops of corresponding lengths rotatable radially about a central bearing, a mechanical drive provided with a change-gear arrangement to vary the speed ratio with the respective conjugate focal distances, means, including a lever, for simultaneously adjusting the roller speeds and lens positions, means, including an electromagnet and its circuit through the two pairs of friction rollers at the said movable extension, and a friction-clutch in the drive of the friction rollers at the said dark chamber, released by the said electromagnet through the interposition of a medium to be copied between the corresponding friction rollers.

In testimony whereof, I affix my signature this sixth day of May, 1919.

AUGUST F. JOBKE.

PLAINTIFF'S EXHIBIT No. 28 E

100,748

PATENT SPECIFICATION

LIBRARY
APR 26 1919
U.S. PATENT OFFICE

Convention Date (Germany), June 22, 1915.
Application Date (in the United Kingdom), June 22, 1916. No. 8798/16.
Complete Accepted, Mar. 20, 1919.

COMPLETE SPECIFICATION.

Improvements relating to the Combined use of Kinematographs and Talking Machines.

I, ERIC MAGNUS CAMPBELL TIGERSTEDT, of 4, Asmusen Allee, Copenhagen, Denmark, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved system or combination of a kinematograph with an apparatus for recording or reproducing sounds.

It has been proposed in photographing a scene to record at the same time sounds or conversations on a steel band secured to the film, and constituting a Poulsen telegraphonic record. With the proposed construction, in photographing the images, the film can be driven only at a restricted velocity, so that with the steel band secured to the film the records would be situated too closely together and the magnetisations of the high strains or tones would partly coincide, so that neither the recording nor the reproducing of the sounds would be satisfactory. In order to obtain an excellent result it is necessary that the steel band should be driven at a velocity exceeding that of the film thereby enabling the magnetisations of the steel band to be located at a sufficiently great distance from each other. It has also been proposed to use a combination of kinematograph film and an optical sound band for recording or reproducing sounds and to drive such band, at a faster speed than the kinematograph film.

The present invention consists in the employment in combination of a kinematograph film and a Poulsen sound band arranged to be operated at a higher velocity than the film band with the object of producing a more precise record and reproduction of the sounds. Other features of the invention will appear from the following description.

In the drawing the invention is diagrammatically illustrated by way of example.

Fig. 1 shows diagrammatically an apparatus for simultaneously photographing images and recording sounds.

Fig. 2 is an apparatus for simultaneously exhibiting images and reproducing sounds, conversations or the like.

Fig. 3 shows a detail.

The photographing of a scene is effected by a common kinematograph 1. By the operation of the film band 2 a roller 3 is positively turned with a peripheral

velocity equal to the lineal velocity of the band 2. On the axis of the roller 3 and outside the kinematograph 1 is provided another roller 32 over which a cord 4 is guided. The diameter of the roller 32 is greater than that of said roller 3. The cord 4 drives a small roller 33 on the shaft of which is secured another roller 5 which moves a steel band 6 with a velocity exceeding the velocity of the kinematograph film 2. The steel band 6 passes between the cores of two electromagnets 7 which are connected with a source of current (battery 8) and a microphone receiving the sound waves. The sound waves serve in effect to produce in the electromagnets 7 fluctuations of current which effect a corresponding local magnetisation of the steel band 6. At the same time the corresponding images are photographed on the film band 2.

In the exhibiting apparatus according to Fig. 2 the images are projected by an apparatus 9 on to a screen 10. On the shaft of the driving roller 35 actuating the film band 2 is fixed a larger roller 11 which is coupled by a transmission connection 12 to a small roller 13. On the axis of the roller 13 is provided another roller 34 which serves as a guide for the magnetised steel band. By the driving force of the roller 34 the steel band 6 is passed between the cores of two electromagnets 14 which are connected to a strengthening relay 15 (for instance a Lieben-tube). The fluctuations of current originated in the electromagnets 14 produce correspondingly strengthened fluctuations in the circuit of a powerful source of current (battery 16) which fluctuations are transmitted to a loud speaking telephone 17 provided near the screen 10. Thus, the telephone 17 reproduces the sounds, conversations or the like in synchronism with the exhibition of images by the kinematograph, it being a presupposition of course that the ratio between the speeds of the steel band and the film band of the exhibiting apparatus is equal to the ratio between the corresponding velocities of the steel band and kinematograph driving mechanism shown in Fig. 1.

In Fig. 3 is illustrated a device which permits disconnection of the coupling between the kinematograph and the apparatus for reproducing records, if it be desired for any reason (for instance for producing particular effects) to stop the film and to allow the mechanism for reproducing sounds to continue its operation.

On the shaft 18 which is continuously rotated by a motor 22 is keyed a roller 36 for moving the steel band and one member 19 of a clutch, the other member 20 of the clutch being loosely mounted on the shaft. On the clutch member 20 is secured the roller 21 forming a transmission element for the driving mechanism of the film band. The clutch member 20 is provided with a peripheral groove which is engaged by the one end of a lever 30. A spring 31 tends to move the two clutch members into engagement with each other. The other end of the lever 30 forms an armature which, when attracted by the energization of an electro-magnet or solenoid 29, is moved in opposition to the spring 31 so that the clutch member 20 is shifted out of engagement with the clutch member 19 and the actuating device for the film band brought out of operative relation with the driving means. By operating a contact button 27 the electromagnet 29 is supplied with energy from a source of current 28. The electromagnet 29 may also automatically be included in the circuit. For this purpose the shaft 18 is provided with a worm 23 which engages a worm wheel having a projection 24. In operation the projection 24 actuates the free end of a bell-crank lever 25 which closes a contact 26 so that the electromagnet 29 is supplied with current and the clutch member 20 moved into its operative position. As soon as the projection 24 has passed the end of the lever 25, the contact 26 is opened. The time during which the contact 26 is closed depends upon the form of the projection.

The lever 30 may also be operated by hand.

The operative relation between the driving mechanism of the film band and the driving mechanism of the steel band may be produced electrically. In recording sounds or the like, several steel bands may simultaneously be acted upon in parallel in order to save or facilitate subsequent duplication.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A system for recording and reproducing sounds and for photographing and exhibiting images, consisting of a kinematograph and a talking machine for Poulsen Phonographic records combined therewith, characterised by the fact that the record band is arranged to be operated at a higher velocity than the film band, with the object of producing a more precise record and reproduction of the sounds.

2. A system as claimed in Claim 1, characterized by the fact that the kinematograph is at predetermined intervals automatically connected with and disconnected from the talking machine by means of a switching device which is controlled by the driving mechanism of the record band.

3. A system as claimed in Claim 1, characterized by the fact that the sounds are recorded on a plurality of steel bands in the recording apparatus in order to save or facilitate subsequent duplication of the records.

Dated this 22nd day of June, 1916.

CRUIKSHANK & FAIRWEATHER LIMITED,
HAROLD CRUIKSHANK FAIRWEATHER,
Director,
65—66, Chancery Lane, London, W.C. 2, and
62, Saint Vincent Street, Glasgow,
Agents for the Applicant.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig 1

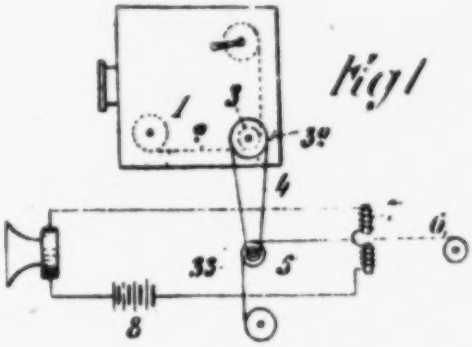


Fig 3.

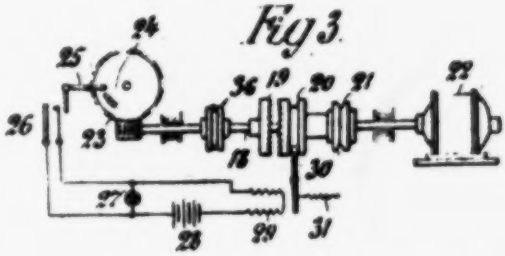
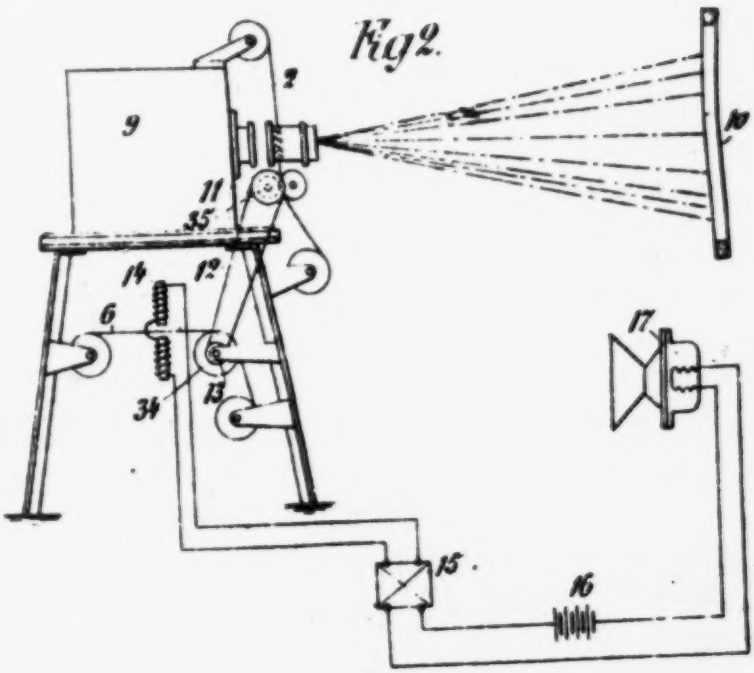


Fig 2.



B. K. & T. BROWN.

PROCESS OF PRODUCING KINEMATOGRAPH FILMS.

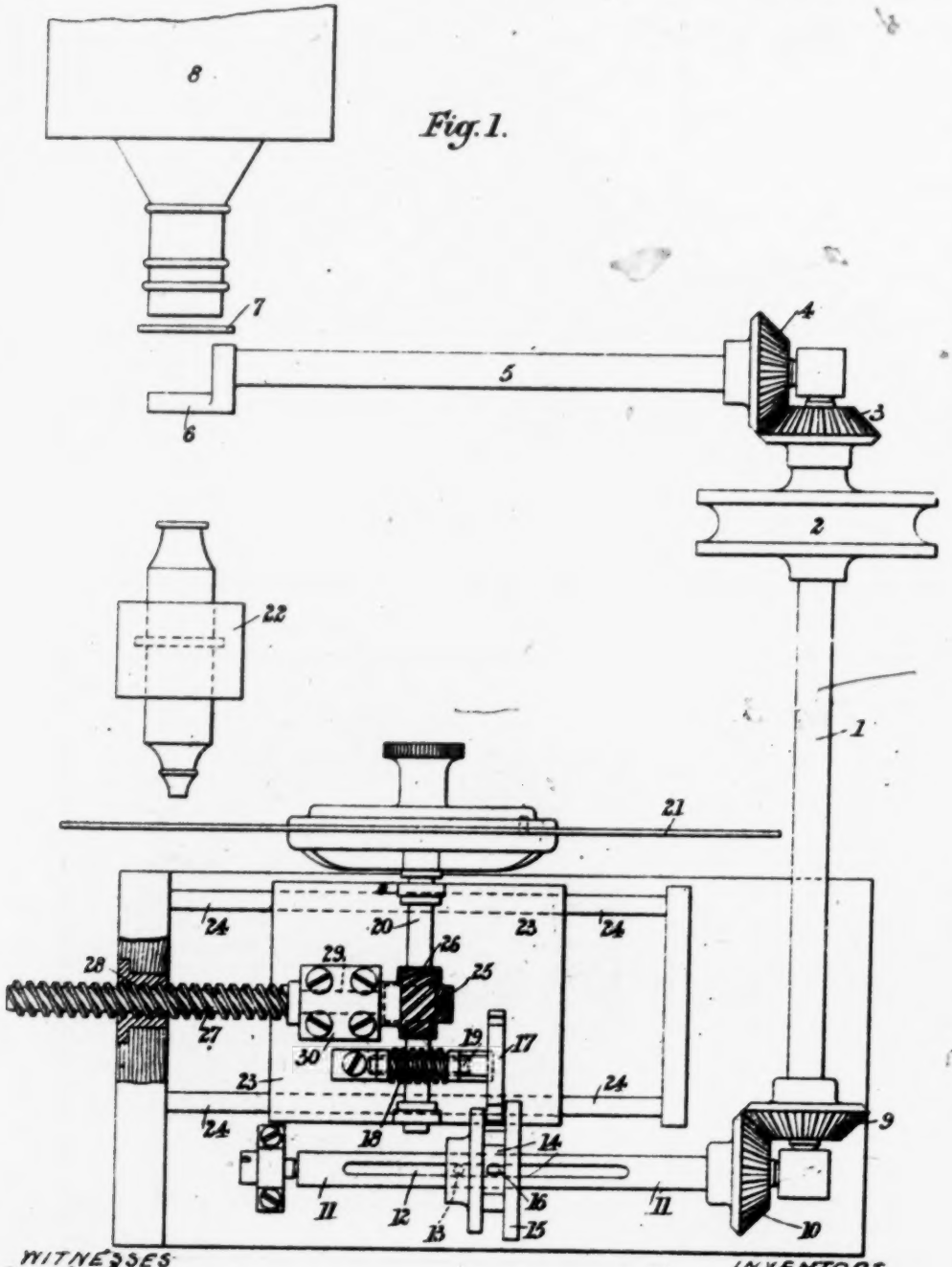
APPLICATION FILED NOV. 6, 1907.

1,034,192.

Patented July 30, 1912.

4 SHEETS—SHEET 1.

Fig. 1.



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PROCESS OF PRODUCING KINEMATOGRAPH FILMS.

APPLICATION FILED NOV. 8, 1907.

1,034,192. Patented July 30, 1912

4 SHEETS-SHEET 2

Fig. 2.

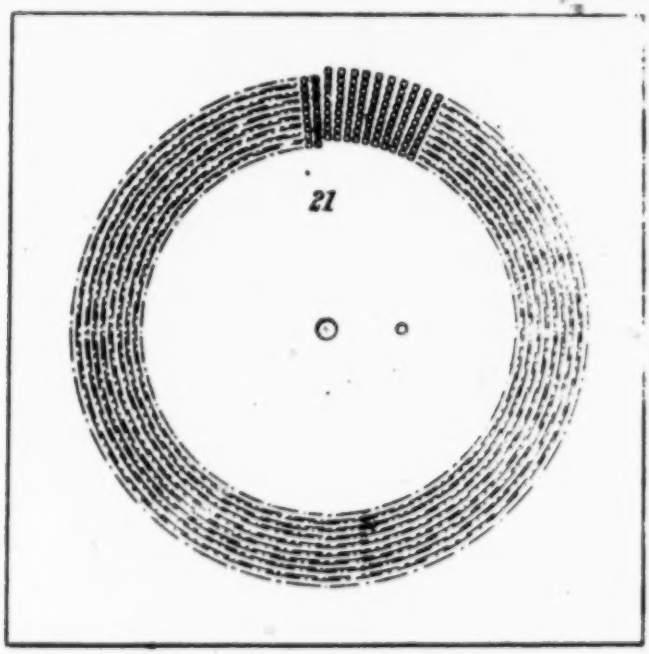
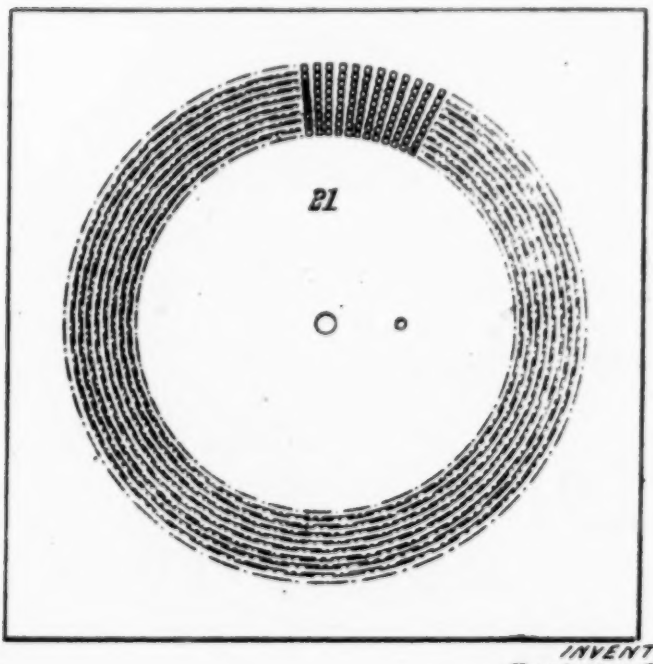


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

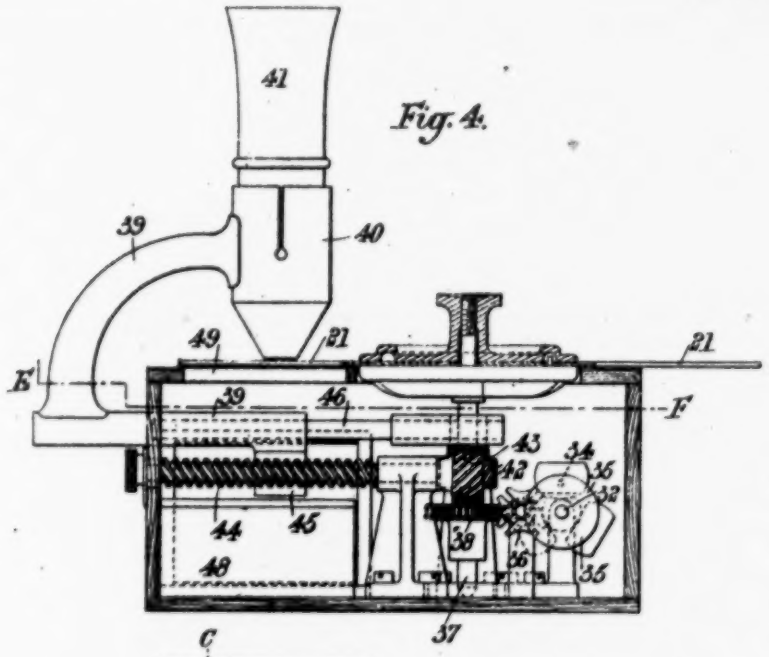
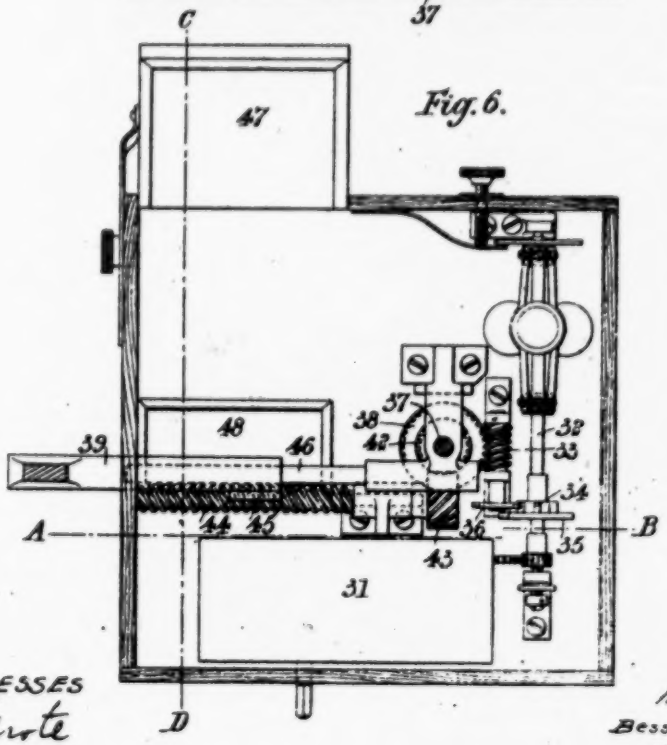


Fig. 6.



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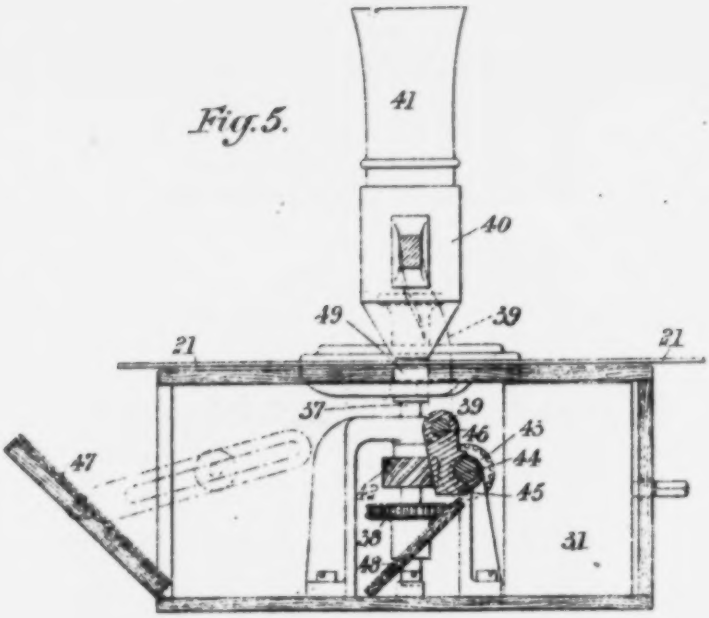
1,034,192.

Patented July 30, 1912.

3 SHEETS—SHEET 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING KINEMATOGRAPH-FILMS.

1,034,192. Specification of Letters Patent. Patented July 30, 1912.

Application filed November 8, 1907. Serial No. 401,961.

To all whom it may concern:

Be it known that we, BESSIE KATE BROWN, lady, a subject of the King of Great Britain and Ireland, and THEODORE BROWN, editor, a subject of the King of Great Britain and Ireland, both of 8 Villa road, Brixton, London, England, and whose post-office address is 8 Villa road, Brixton, London, S. W., have invented new and useful Improvements in Processes of Producing Kinematograph-Films, of which the following is a specification.

This invention relates to the production of photographic images of reduced magnitude from ordinary kinematograph film pictures, and the said reduced images being received upon suitable sensitive medium in series corresponding approximately with any series of pictures on an ordinary kinematograph film, and the said reduced pictures, or prints therefrom, being more especially adapted for use in a small exhibiting apparatus for direct vision by individuals, although they may be used for exhibition by projection on a screen. Provision is made for photographing the said reduced images in series from ordinary kinematograph films so as to form either a spiral series, or in two, or more, spiral series, or a series in a ring, or in series in concentric rings. Several entirely different subjects may follow each other in any one series of pictures, when arranged in spiral order; or when the pictures are arranged in rings, or in two, or more, spiral series, each ring, or spiral, may be occupied by pictures devoted to one subject only, or one subject may be continued throughout all the rings, or spirals, or any required number, or portion, of them.

The method of obtaining the aforesaid reduced kinematographic pictures according to this invention is indirect, they not being photographed direct from nature, but being photographed on a reduced scale, from either negative, or positive, images, previously taken by an ordinary kinematograph camera, or by means of the standard film printer. To effect this, an ordinary kinematograph picture film is passed through an ordinary kinematograph projector and lantern, or kinematograph camera, and at a suitable distance from the said kinematograph projector, and lantern, or kinematograph camera, is mounted a microscope, with the eye-piece thereof facing the gate of the kinematograph projector and lantern, or kinematograph camera, and with its optical axis in a line with the center of each picture, and at right angles thereto, when it is presented to be copied. At the opposite end of the microscope, and near to the objective lens thereof, is situated the sensitized plate, or film, upon which the reduced pictures are to be received. The reduced pictures are preferably obtained on the said plate, or film, in the form of a spiral series by intermittently revolving the plate, or film, one picture space forward, and at the same time moving it radially; such movement being made while the projecting illuminant, or the day-light, is shut off from the microscope, by the intervening shutter of the kinematograph. While the said movement of the disk is being accomplished, the corresponding movement of the ordinary kinematograph film through the kinematograph projector and lantern, or kinematograph camera, is also accomplished.

To obtain the series of reduced pictures in the form of concentric rings, instead of a spiral, the disk is moved radially only upon the completion of each ring of pictures. The sensitive emulsion upon which the reduced images are photographed, is of a structureless nature, such, for instance, as collodion emulsion, or the emulsions employed for process plates, or films. This invention therefore especially consists in utilizing any ordinary negative, or positive, series of kinematograph pictures as originals from which to make reduced copies upon an emulsion, such as those aforesaid, which emulsions are of a character adapted to receive the details of the reduced pictures, but which, on account of their being but slowly affected by light, are not adapted for use in photographing moving subjects direct from nature. Thus, although the ordinary kinematograph film pictures from which the reduced copies are made, may consist of a series taken at the usual rate of say sixteen pictures every one second of time, in taking the reduced pictures according to this invention, the time during which each of such pictures in a series is allowed to remain stationary for the purpose of copying it onto the plate, or film, sensitized with an emulsion of the character aforesaid, can be prolonged to the requisite extent. The reduced pictures thus form records, which, or

(if they be negatives) positives taken therefrom, can be viewed through a microscope, or projected onto a screen, while each successive picture in a series is, by suitable mechanical means, brought into its proper position for exhibition, the speed at which the successive pictures are presented to the observer corresponding approximately with the speed at which the original kinematograph pictures were photographed.

We will now describe apparatus adapted for the purposes of this invention, premising that we do not limit ourselves to the precise constructions illustrated.

Figure 1 is a plan of apparatus adapted for taking the reduced series of copies of pictures from a series of ordinary kinematograph pictures.

Rotary motion is imparted by any suitable means (such as a band passing over the pulley 2) to a shaft 1, which motion is transmitted by bevel wheels 3 and 4 to a shaft 5 carrying a crank 6, which brings the ordinary kinematograph pictures on the film 7 successively in front of the lens of the projector, or camera, 8. The said shaft 1 also drives, through the bevel wheels 9 and 10, the shaft 11, having in it a slot 12, with which engages a pin 13, carried by a boss 14, provided with a disk 15 carrying a pin 16, which engages with a notch of the Maltese cross 17 secured to the worm-shaft 18, so as to impart motion of partial rotation at the requisite times (corresponding to the operation of the crank 6 on the film 7) through the worm-wheel 19 to the shaft 20, carrying the sensitised plate, or film, 21, between which, and the optical axis of the projector, or camera, 8 is mounted a microscope 22.

The shaft 20 is mounted in bearings on a carriage 23, running on rails, or rods, 24, and longitudinally moved intermittently by a worm-wheel 25, on the shaft 20, engaging a similar wheel 26, secured to a screw 27. One end of the screw 27 passes through a nut 28 in the frame of the apparatus and a part 29 of the screw 27 engages in a recess in the projection, or bearing, 30, so that the carriage 23 moves longitudinally on the rails, or rods, 24, when the screw 27 is rotated. The slotted connection of the boss 14 with the shaft 11 enables the said boss to follow the table in its motion to maintain the driving position of the pin 16 and Maltese cross 17.

The combined radial and rotary movement of the plate, or film, 21, effected as aforesaid before each successive copy is taken thereon, causes the reduced pictures to be taken in a spiral series on the said plate, or film. Thus, from ordinary kinematograph negative, or positive films, reduced negative, or positive, pictures can be taken upon glass, or any other suitable material, and with any time of exposure required by the particular sensitizing material used, which is of a character adapted to receive the very fine details of the reduced pictures, whereas the sensitized material necessary for the very rapid exposures in taking photographs direct from moving objects is of a grain, or character, not adapted to receive such fine details.

The plate, or film, 21 is, of course, inclosed in a casing, or otherwise protected from access of actinic rays, except those which pass through the microscope 22.

Fig. 2 is a face view of a plate, or film, having the reduced photographs in a spiral form.

Fig. 3 shows a plate, or film, with the reduced photographs in concentric rings, which will, of course, be produced by imparting radial movement to the disk carrier only after each circle of photographs is completed. The plates, or films, are shown square and are presumed to be negatives, from which positives will be printed, and these positives can be cut into disk form.

Figs. 4, 5 and 6 are views showing a construction of apparatus adapted to exhibit kinematograph pictures taken as aforesaid or usually positives taken from negative pictures produced as aforesaid, Fig. 4 being a longitudinal sectional elevation on the line A B Fig. 6, Fig. 5 a transverse sectional elevation on the line C D Fig. 6, and Fig. 6 a horizontal section on the line E F Fig. 4.

We explain this exhibiting apparatus in order to show a means by which our invention can be utilized in exhibiting, although this exhibiting apparatus is not claimed in the present application.

Rotary motion is imparted, from clockwork mechanism contained in the casing 31, to the shaft 32 (shown as being provided with a governor and brake for regulating the speed) and from this intermittent motion of partial rotation is transmitted to a worm-shaft 33, by means of a pin 34, on a disk 35, secured to the shaft 32, the said pin engaging at each rotation a notch in the Maltese cross 36 secured to the worm-shaft 33. This intermittent motion of partial rotation is transmitted from the worm 33 to the shaft 37 by the worm-wheel 38. The shaft 37 carries the disk 21 of reduced pictures in any suitable way. An arm, or bracket, 39 carrier, in a socket 40, a microscope 41, which is caused to intermittently move longitudinally (as each picture on the disk is presented) by means of a worm-wheel 42, fixed to the vertical spindle 37 and engaging with a similar wheel 43, secured on the end of a screw 44, with which engages a nut, or preferably a half nut, 45, secured to the bracket, or arm, 39. The said bracket, or arm, is mounted on a guide-rod 46, upon which it can slide, and, if a half nut be used at 45, the said bracket, or arm, can be turned

to fold the said arm down (or it can be detached from the apparatus) for packing. A mirror 47, or mirrors, may be employed for directing light through an opening in the casing to another mirror 48, or mirrors, from which the light is directed through an aperture 49 to the underside of the disk 21. The mirrors are shown flat, but they may be of any other desired shape such, for instance, as to condense the light onto the pictures.

In order that the pictures may be satisfactorily reproduced, the pitch of the screws 27, and 44, the pitch of the worms 18, and 33, and the pitch of the worm-wheels 19, and 38, and their engaging gears respectively, should be identical both in the taking and exhibiting apparatus.

If the pictures on the disk 21 be arranged in concentric rings, instead of in a spiral, or in spirals, the radial movements of the microscope will of course be made to take place only after each series of pictures forming a ring has been exhibited.

When the pictures are in a ring, they may be viewed repeatedly, the subject of course being repeated at each revolution of the ring.

It will be understood that two, or more, series of pictures may be arranged spirally on the plate, or film, instead of in concentric rings, in which case the spirals would be arranged the one within the other.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

In the process of producing a kinematographic film, the exposure of a slow acting light sensitive film to the reduced images of an ordinary kinematographic series as photographed from life on an ordinary quick acting light sensitive film, whereby a reduced image containing substantially all the details of the latter is secured, substantially as and for the purpose described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

BESSIE KATE BROWN.
THEODORE BROWN.

Witnesses:
GILBERT FLETCHER TYSON,
WILLIAM GERALD REYNOLDS.

P. ULYSSE.

NATURAL COLOR CINEMATOGRAPHY.

APPLICATION FILED JAN. 19, 1914.

1,161,910.

Patented Nov. 30, 1915.

2 SHEETS—SHEET 1.

Fig. 1

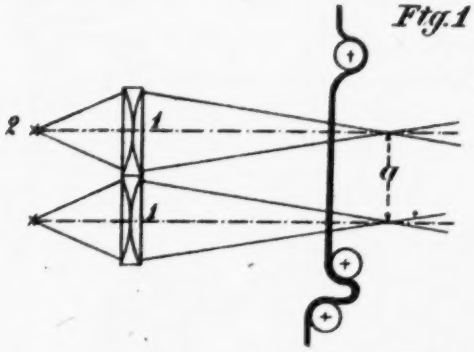
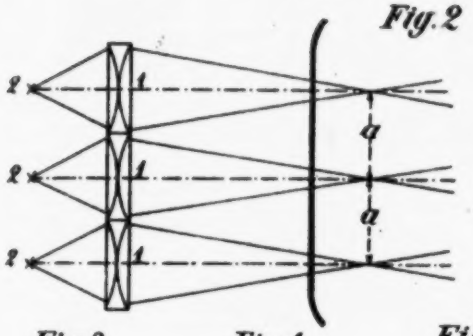


Fig. 2



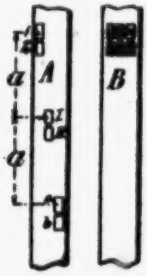


Fig. 3

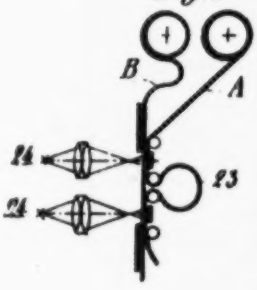


Fig. 4

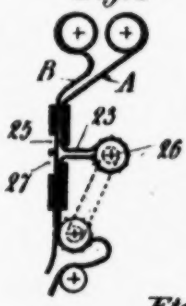


Fig. 5

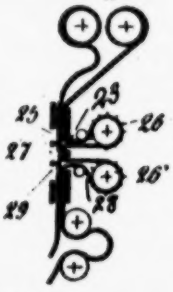


Fig. 6

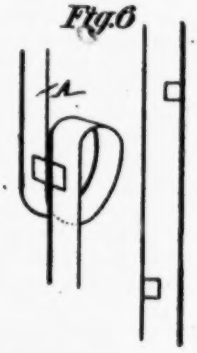
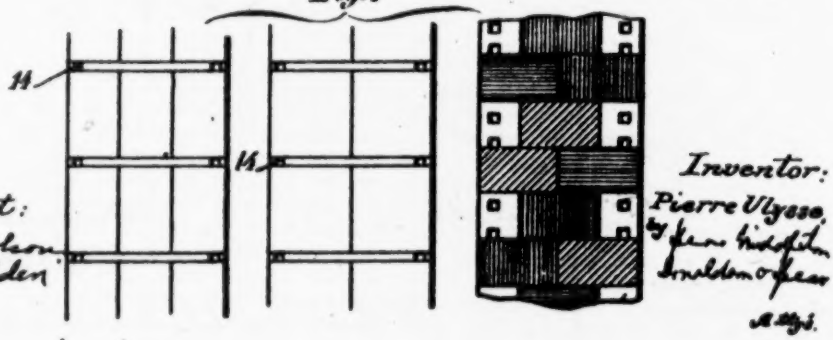


Fig. 7



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NATURAL COLOR CINEMATOGRAPHY.

APPLICATION FILED JAN. 19, 1914.

1,161,910.

Patented Nov. 30, 1915.

2 SHEETS—SHEET 2.

Fig.9

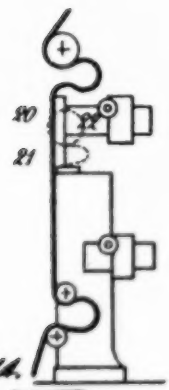


Fig.10

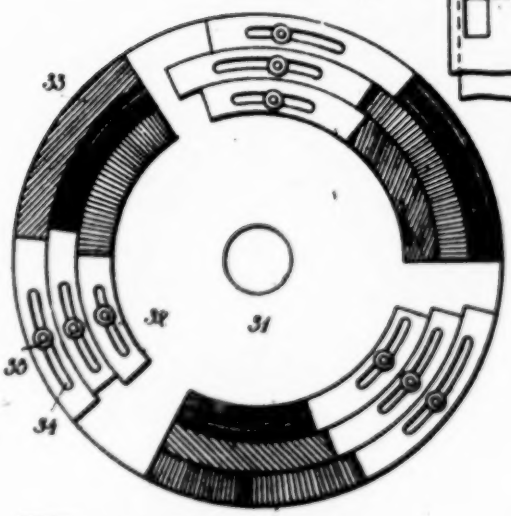


Fig.13.

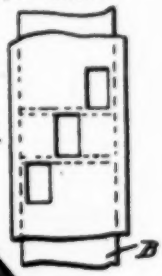


Fig.14.

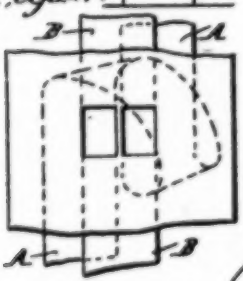


Fig.11.

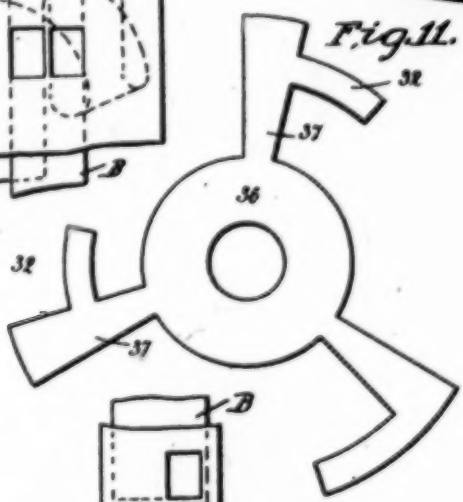
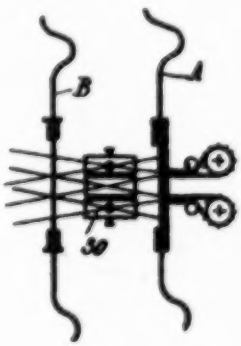


Fig.8



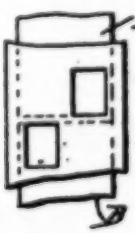


Fig.12.

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NATURAL-COLOR CINEMATOGRAPHY.

1,161,910. Specification of Letters Patent. Patented Nov. 30, 1915.

Application filed January 19, 1914. Serial No. 813,008.

To all whom it may concern:

Be it known that I, PIERRE ULYSSE, a citizen of the French Republic, residing in Marseille, France, have invented certain new and useful Improvements in Natural-Color Cinematography, of which the following is a specification.

The present invention relates to a printing device by which a positive film with n selected images having a longitudinal and lateral displacement can be obtained from a negative film with n selected images grouped on the area of an ordinary black and white image. The simultaneous illumination of the n selected images by n luminous sources enables the amount of light received to be regulated according to the color of the selecting screen interposed; it further enables the relative values of the colors in the various selected images to be made the same as in the corresponding image in natural colors. However the distance between the axes of the selected images of reduced dimensions renders it impossible to place side by side several distinct luminous sources.

In the present invention the displacement of the selected images on a positive film enables the said images to be placed at distances equal to those separating the luminous sources; these distances can be as large as is necessary. Owing to the distance between the centers of the projecting lenses it is possible to use lenses of a larger relative aperture and longer focal length and to place them in ordinary cylindrical fittings with an ordinary iris diaphragm.

In the accompanying drawings given by way of example: Figures 1 and 2 show, for a two-color film and for a three-color film, the arrangements by means of which it is possible to obtain, in accordance with the invention, the illumination of two or three selected images which must be superposed on the observation-screen for reconstructing the image in natural colors; the films A and B represent in each case the positive and negative films obtained for the purpose of making possible the illumination of the selected images according to the invention. Figs. 3–5 show diagrammatically printing devices, by means of which it is possible to obtain, with negatives such as B in which the n selected images are grouped on the surface of an ordinary black-and-white image, such positives as A, in which the n images are situated on the film at distances corresponding respectively to those separating the luminous projection sources. Fig. 6 is another modification of the printing device. Fig. 7 shows a number of films obtained by the application of the means shown in Fig. 6, the selected images occupying in this case the whole width of the film. Fig. 8 is another modified construction of the printing device. Fig. 9 shows diagrammatically modifications to be made in an ordinary projecting apparatus to use the films shown in Figs. 1, 2 and 7. Figs 10 and 11 show the means used for varying the time of exposure in accordance with the color of the filter and the value of the luminous absorption produced by the latter. Figs. 12, 13 and 14 are diagrams showing the position of the windows of the printing devices of Figs. 4, 5, and 6 respectively.

In accordance with the present invention, for the purpose of enabling the n selected images, the superposition of which on the observation screen reproduces the image in natural colors to be uniformly lighted, the said images (the dimensions of which are such that the surface of the n selected images should be at the outside equal to that of an image of an ordinary black-and-white film) are distributed on the film in such a manner that their distances correspond to the distance required for the arrangement of distinct luminous sources and the corresponding condensers. This makes it possible to use luminous sources of different power for lighting the n selected images. In that way, if as an example the case of a two-color selection is taken, it will be seen that if a (Fig. 1) indicates the vertical height which separates the axes of the projecting systems constituted by each luminous source, each condenser and each projecting lens, the corresponding images on the film, which must be projected simultaneously will also be separated by a distance equal to a. The difference in the distribution of the selected images on the negative film B obtained in the usual manner, and on the positive film A, can be readily seen in the case illustrated. The negative film B comprises, in the surface corresponding to that of an ordinary image in black, two selected images I and II, taken at the same moment, while the corresponding images I II on the positive film A are at a distance equal to a. These

selected images will be simultaneously projected and must coincide on the observation screen. The same would be the case with three-color selection. The three selected images occupying the surface of an ordinary image in the negative B, are separated on the positive, by the distance *a* separating the axes of the three luminous sources 2 and of the corresponding condensers 1.

In order to obtain a film with selected images, in which the *n* selected images are separated on the film by a distance equal to that separating the principal axes of the optical projection systems 2, 1, the following device could be used: The negative B (Figs. 1 and 2) is obtained in the usual manner, that is to say, the *n* selected images I, II . . . which are taken simultaneously are grouped in the surface corresponding to that of an ordinary black-and-white image. Behind the negative B is placed the film A which must be printed upon in order to form the positive film (Fig. 3), the said film forming one or more loops 23 between the portions of the film which are applied behind the negative and intended to receive the corresponding selected images. The loop 23 has a length equal to *a*, the distance between the axes of the projecting systems, so that when the film is unfolded, it is easy to see that the images I, II . . . simultaneously taken, are separated by a distance equal to the length *a* (Figs. 1 and 2). The positive and negative films are naturally given similar periodical movements.

It may be seen in Fig. 3 that the printing apparatus does not differ from similar known apparatus, except by the increased length of its printing aperture, for the purpose of providing it with the two windows through which appear the portions of the film to be printed, these windows and these superposed surfaces, in the construction illustrated, are lighted by distinct luminous sources, for instance Nernst lamps 24.

In practice, in order to obtain the positive images printed in a device similar to that shown in Fig. 3, as near together as possible, the arrangements shown in Fig. 4 (two colors) and in Fig. 5 (three colors) are used. In these printing devices, the positive film A', after having passed in front of the window 25, passes through a narrow slot made in the rear wall of the passage (Fig. 4). Its direction is changed so that it is brought at a right angle to the plane of the passage and passes over a driving drum 26 (Maltese cross or cog wheel) controlled by the unwinding mechanism. The film is then brought parallel to itself in order to enter the passage of the film through the same slot, or through another slot made in the bottom of the passage. The film thus passes in front of the second window 27, the part of the film situated outside the passage and passing over the drum 26, constituting the loop, having a length equal to *a*, which separates two selected images taken simultaneously through the windows 25, 27.

When it is necessary to take simultaneously three selected images, the film, after having formed a first loop 23, as in the preceding case, travels in front of the window 27 and enters a slot of the passage, enabling a second loop 28 to be formed, which embraces and drives the drum 26'. The film, on again entering the passage of the printing device, passes in front of a third window 29. Although the selected images are thus separated on the film, to the length of the loop 23, 28 separating the same, it will be seen that the points of view of the *n* images simultaneously taken, are as near together as possible, which avoids any deformation and consequently cannot affect the superposition of the selected images on the observation screen. Moreover, instead of bringing back the upper and lower parts of the film in line with each other in the same passage of the apparatus (Figs. 4 and 5) the loop 23 can be formed so that the said parts are parallel to each other and placed side by side in different passages of the printing device (Fig. 6). The example in Fig. 6 shows that it is advantageous, for the purpose of bringing the points of view nearer together, to extend the images to the very edges of the film. In that way the films are obtained which differ from those hitherto used by the selected images occupying the whole width of the film, instead of being comprised as usual, between the marginal driving perforations. The perforations are then situated between the groups of *n* images (Fig. 7) or, according to the arrangement of the latter, in the part of the film which the *n* images do not cover. The use of printing devices forming loops on the positive can however be avoided, by using special means during the taking, so as to obtain a negative directly, the *n* images of which, taken simultaneously, are arranged at a certain distance from each other as shown in the case of the positive A (Figs. 1 and 2). To that end, it is sufficient to cause the negative film to make a loop in the camera similar to that which the positive makes in the printing device. The positive is then printed by ordinary means.

For the purpose of projecting, an apparatus for black-and-white cinematography may be used, since the film with displaced images has the same amplitude of unwinding as an ordinary film. It is simply sufficient to add to this apparatus guiding windows and additional lenses which must be separated from each other and from the ordinary lens with which the apparatus is provided, by the distance

separating the axes of the selected images which have to be projected simultaneously. As shown in Fig. 9 for the case of projection in two colors, it is sufficient to remove from the ordinary projecting apparatus the upper drum 20 supporting the film, and to replace it by a support 21. This support forms an extension of the passage of the apparatus and has one or more windows with the corresponding lenses. The drum receiving the film is simply put on and secured above the auxiliary support.

In order to insure, without it being necessary to set the lenses, perfect superposition of the selected images on the observation screen when subjects situated in very different planes (1 and 10 meters for instance) are projected, lenses 30 are inserted between the negative B and the unexposed positive film A. The images are therefore not printed by contact, but projected from the negative on to the sensitive film. To that end, the negative B and its passage are situated at a certain distance from the positive A and from its unwinding and guiding device (Fig. 8). Between the latter are inserted object glasses 30 which can be adjusted in every direction.

Before introducing the unexposed film A into the printing device, the negative B is caused to travel in the apparatus and, by means of the lenses 30 which can be suitably adjusted, superposition of negative images thus projected on to an observation screen placed at a suitable distance, is insured. When this superposition is obtained, the lenses 30 are locked in the relative positions which they occupy, the film A is introduced into the apparatus, and in front of the negative B, the projecting lamp is replaced by the luminous source generally used for printing films. The selected images are then projected from the negative B on to the film A, so that when the film thus obtained is introduced into the projecting apparatus, there is a certainty that an exact superposition of the selected images will be obtained on the observation screen, and consequently faithful reproduction of the animated image in its natural colors.

It will be understood that, by using the preceding means, it is possible, by previous adjustment of the lenses 30 belonging to the printing apparatus, to obtain a positive, the selected images of which will coincide exactly on the observation screen, without it being necessary to modify the setting of the lenses, whatever be the distance of the subject from the apparatus for taking the views.

Referring to Figs. 4 and 5, the windows 25, 27, 29 are so arranged that an oblique row of negative images is printed simultaneously—for instance the images (1, II), (2, III); (3, IV), etc., in the two-color film, and the images (1, II, *c*), (2 III, *d*), etc., in the three color film. The loops 23, or 23 and 28, must therefore be so adjusted that the widely separated positive images corresponding to a lateral row (2, II), or (2, II, *b*)—that is, to a simultaneously-taken set—will be separated by the distance *a*. In this way it is insured that the *n* simultaneously taken positive images are also simultaneously projected. The diagonal arrangement of the printing windows in these two cases is shown in Figs. 12 and 13, the looped film being shown in dotted lines. Fig. 14 is a similar view showing that when the film is looped as in Fig. 6, there is no need to arrange the windows diagonally. The windows 25, 27, 29 may also be arranged so that any other oblique row of negative images is printed simultaneously, for instance (1, III), (2, IV), etc., in the two-color film, and (1, III, *e*) (2, IV, *f*), etc., in the three-color film.

As stated above, it is necessary for obtaining a correct reproduction of the colors, not only to light the selected images by luminous beams the intensity of which depends on the color of the selecting filter (which is obtained by the preceding means) but also to take into account the difference of sensitiveness of the emulsion to different colors passing through the said screens. As the sensitiveness of the film cannot be modified, the time of exposure of the various selected images is modified in accordance with the relative sensitiveness of the emulsion to light of the corresponding color. To that end, on the rotary shutter 31 (Fig. 10) which supports in the known manner the color-filters are arranged adjustable shutter-leaves 32 which enable the length of each of the colored segments 33 to be modified relatively to those with which they coöperate. In order to shift the said shutter-leaves 32 and to modify the useful length of each screen 33 and therefore the time of exposure, of the corresponding selected images, the said segment-shaped leaves are provided with grooves 34 which slide on screw-threaded pins provided with locking nuts 35 enabling them to be locked in the relative positions which they occupy after the regulation. When the rotary shutter 31 carries several series of colored screens, the distributions of which can be identical or different, it is preferable to arrange the shutter-leaves 32 regulating in each group the length of the filters of the same color, so that they are simultaneously given equal angular movements. To that end, the segment-shaped shutter-leaves 32 corresponding to the filters 33 of the same color, can be supported by arms 37 arranged radially around a central hub 36. The angular movement of the whole of this, relatively to the shutter 31 and to the filters supported by the latter, thus enables the time of exposure

of the image to be varied to a corresponding extent, for the purpose of compensating for the differences in sensitiveness of the emulsion to light of various colors.

What I claim as my invention and desire to secure by Letters Patent is:—

1. An apparatus for printing positive cinematograph films from negative films having a plurality of selected images grouped on each standard picture-area, comprising passages adapted to guide the positive and negative films, means comprising sprocket wheels for driving said films, means for maintaining a loop in the positive film, windows in said passages adapted to expose parts of the films adjacent either end of said loop, whereby images can be printed wide apart on the positive film from images close together on the negative film.

2. An apparatus for printing positive cinematograph films from negative films having a plurality of selected images grouped on each standard picture-area, comprising passages adapted to guide the positive and negative films, means comprising sprocket wheels for driving said films, means for maintaining a plurality of loops in the positive film, windows in said passages adapted to expose parts of the films adjacent either end of each loop, whereby images can be printed wide apart on the positive film from images close together on the negative film.

3. An apparatus for printing positive cinematograph films from negative films having a plurality of selected images grouped on each standard picture-area, comprising separate passages adapted to guide the positive and negative films, means comprising sprocket wheels for driving said films, means for maintaining a loop in the positive film, windows in said passages adapted to expose parts of the positive film adjacent either end of said loop, lenses situated between the two films adapted to project the images on the negative film on to the positive film, and means for adjusting said lenses to correct parallax error introduced during the taking of the negative images, for the purpose described.

4. An apparatus for printing positive cinematograph films from negative films having a plurality of selected images grouped on each standard picture-area, comprising separate passages adapted to guide the positive and negative films, means comprising sprocket wheels for driving said films, means for maintaining a plurality of loops in the positive film, windows in said passages adapted to expose parts of the positive film adjacent either end of each loop, lenses situated between the two films adapted to project the images on the negative film on to the positive film, and means for adjusting said lenses to correct parallax error introduced during the taking of the negative images, for the purpose described.

5. An apparatus for printing positive cinematograph films from negative films having a plurality of selected images grouped on each standard picture-area, comprising passages adapted to guide the positive and negative films, means comprising sprocket wheels for driving said films, means for maintaining a loop in the positive film, windows in said passages adapted to expose parts of the film, said parts being normally separated by a distance equal to the length of the film comprising the loop, whereby images can be printed wide apart on the positive film from images close together on the negative film.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PIERRE ULYSSE.

Witnesses:

LUCILE OUNDRY,

F. A. MATERNUTZ.

F. L. DYER & D. HOLDEN.

APPARATUS FOR PRINTING MOVING PICTURE FILMS.

APPLICATION FILED DEC. 21, 1906.

970,614.

Patented Sept. 20, 1910.

2 SHEETS—SHEET 2.

Fig. 4

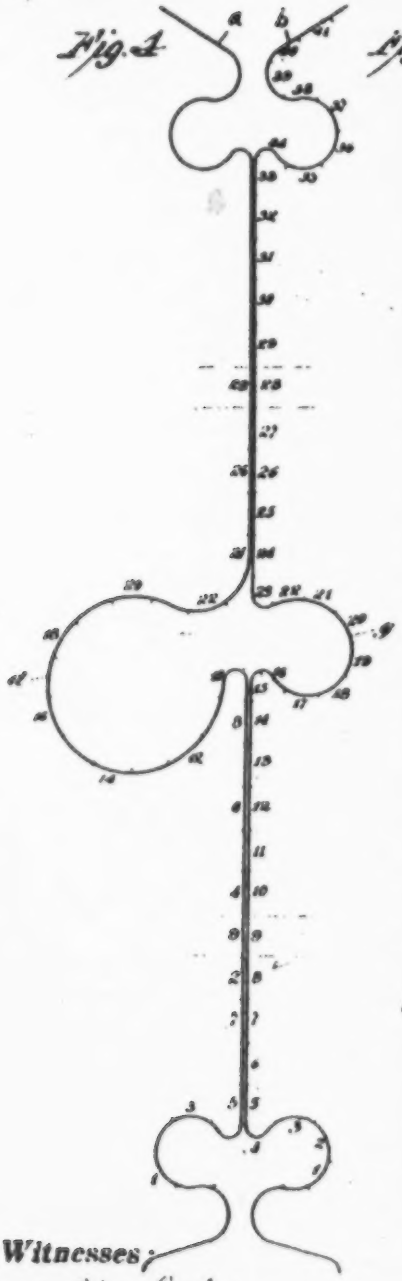


Fig. 5

Fig. 6

Witnesses:

Inventors

Attorney

F. L. DYER & D. HOLDEN.

APPARATUS FOR PRINTING MOVING PICTURE FILMS.

APPLICATION FILED DEC. 21, 1909.

970,614. Patented Sept. 20, 1910.

2 SHEETS—SHEET 1.

Fig. 1

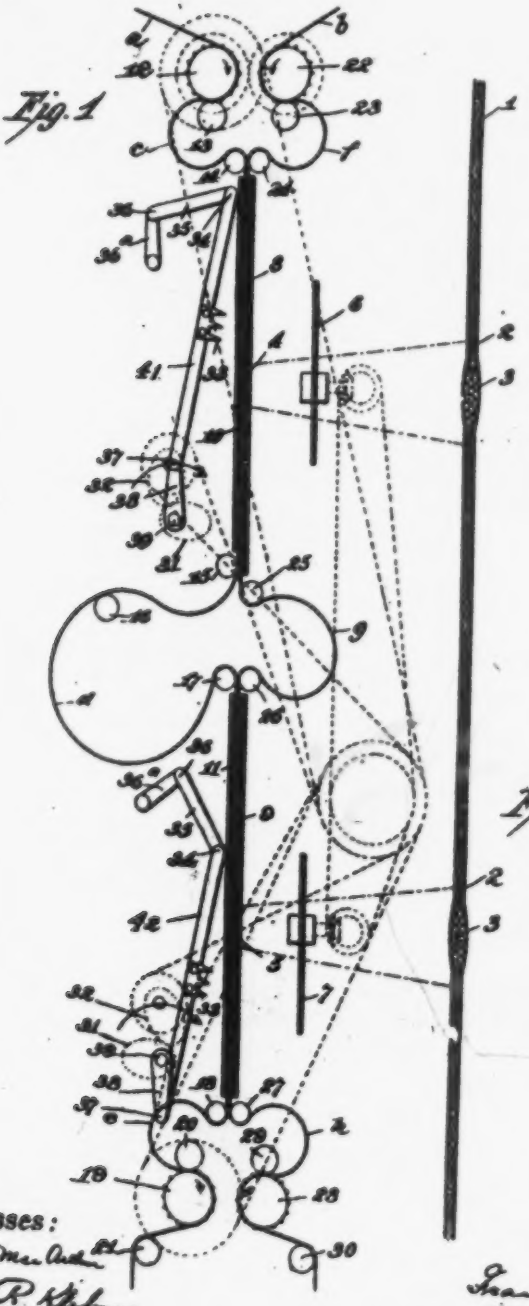


Fig. 2

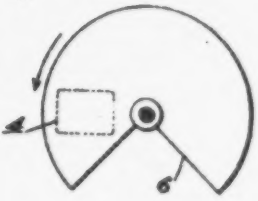
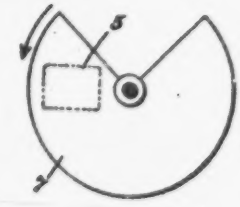


Fig. 3



Witnesses:

Inventors

Frank L. Dyer.

Allen Holden

by Frank L. Dyer

Attorney

UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, AND DELOS HOLDEN, OF UPPER MONTCLAIR, NEW JERSEY, ASSIGNORS TO EDISON MANUFACTURING COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR PRINTING MOVING-PICTURE FILMS.

970,614. Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed December 21, 1906. Serial No. 349,236.

To all whom it may concern:

Be it known that we, FRANK L. DYER, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, and DELOS HOLDEN, a citizen of the United States, and a resident of Upper Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Printing Moving-Picture Films, of which the following is a description.

Our invention relates to apparatus for the production of a moving picture film characterized by the arrangement of the photographs in two arithmetical series the members of which alternate, and one series being shifted longitudinally of the film as regards the other series, so that the pictures do not follow each other on the film in regular numerical sequence but the photographs of one series are preceded by photographs of the other series which are representative of later phases of movement, whereby it becomes possible to exhibit the pictures of the two series in proper numerical order at separate display openings which are situated at some distance from each other, by intermittently moving the film at each opening in alternation a distance equal to the length of two adjacent pictures. The pictures of one series are all exhibited at one opening and the pictures of the other series at the other opening and there may be a continuous or uninterrupted exhibition of stationary photographs somewhat analogous to the exhibition of dissolving views and flickering entirely eliminated.

The present invention has for its object the provision of means whereby such positive moving picture films may be printed directly by the simple passage of the film through the apparatus from negatives having the usual arrangement of photographs in a continuous unbroken sequence.

In order that the invention may be better understood, attention is directed to the accompanying drawings forming part of this specification, and in which

Figure 1 is a vertical sectional view of an apparatus constructed in accordance with our invention; Figs. 2 and 3 are front views showing respectively the upper and lower shutters and exposure openings of Fig. 1; Fig. 4 is a diagrammatic view showing the relative positions of the negative and sensitive films as they are passed through the apparatus; and, Figs. 5 and 6 are detail views of fragments of the negative and positive films respectively the latter viewed from the back.

In all the views corresponding parts are designated by the same characters of reference.

Referring to Fig. 1 of the drawing, the printing machine will be situated in a dark room close to a wall 1 provided with a pair of openings 2, 2 which are closed by condensing lenses 3, 3 which receive the light from any suitable source and direct the same to the upper and lower exposure openings 4 and 5 respectively. In front of the opening 4 is a rotary shutter 6 and in front of the opening 5 is a similar shutter 7, said shutters being provided with cut-away portions as shown, of sufficient extent to enable a proper exposure to be made when continuously rotated in any suitable manner, as is well understood. The two shutters are shown as set with the cut-away portions 180 degrees apart, but this is immaterial, as the shutters may be set in any positions whatever so long as the cut-away portions cross the openings 4 and 5 during the periods of rest of the films at such openings. These periods of rest may occur either coincidently or in alteration at the two openings, but in the machine illustrated the said periods occur in alternation. The exposure openings 4 and 5 are formed in fixed plates 8 and 9 respectively. The sensitive and negative films *a* and *b* respectively pass directly behind the said openings, being suitably held by plates 10 and 11 which may be hinged along one edge if desired to permit the films to be readily threaded through the apparatus. The sensitive film passes from a suitable supply reel over a continuously operated sprocket 12 with which it is held in engagement by an idler 13 and forms a loop *c*, passing thence over an idler 14, thence between the plates 8 and 10, and then over the idlers 15 and 16 to form a loop *d*. This film then passes over an idler 17 thence between the plates 9 and 11 and over the idler 18 to form a loop *e*. It then passes over a continuously operated sprocket 19 with which it is held in engagement by the idler 20; thence over an idler 21 to a suitable take-up reel. The negative film *b*

passes from its supply reel over the continuously operated sprocket 22 with which it is held in engagement by the idler 23 and forms a loop *f*. It then passes over the idler 24 and between the plates 8 and 10; thence over an idler 25 to form a loop *g* which is of different length from the loop *d*, being either larger or smaller. The film *b* then passes over the idler 26 and between the plates 9 and 11 from which it passes over an idler 27 to form a loop *h*; thence over the continuously operated sprocket 28 with which it is held in engagement by an idler 29; thence over an idler 30 to a suitable take-up reel.

The film feeding mechanism comprises means for intermittently feeding the films at two exposure openings 4 and 5 and may be of any suitable type, that shown being illustrated in U. S. Patent No. 714,845 granted December 2, 1902 to James H. White, and comprises the two oscillating frames 41 and 42 having teeth 33 which pass through slots in the plates 10 and 11 respectively and engage the usual holes or perforations *i* provided along the edges of the films *a* and *b*, one end of each of said frames being pivoted at 34 to a link 35 which is pivotally supported at 36 by an oscillating arm 36ª and the other end of said frames 41 and 42 being pivoted at 37 to a crank 38 carried by a shaft 39, driven through the gears 31 and 32 by any suitable driving mechanism. The intermittent movement of the teeth 33 will carry the film at each engagement a distance equal to twice the height of the openings 4 and 5 and the films will be so threaded through the apparatus that different sections will be brought to rest and exposed at the openings 4 and 5, those which are brought to rest at the opening 4 being moved past the opening 5 without stopping, by the feed mechanism located at said opening, and vice versa those sections which are to be exposed at the opening 5 will be carried past the opening 4 without any exposure, so that the impressions produced by the light admitted by the shutters 6 and 7 respectively will fall upon distinct portions of the film *a*, said portions alternating with each other. Thus as shown in Fig. 4, the ninth picture of the negative is brought to rest at the lower exposure opening opposite a blank section of the film *a*, situated between sections upon which the second and fourth pictures of the negative have already been printed at the upper exposure opening. In this diagram, all the photographs of the negative which correspond to even numbers are printed at the upper exposure opening and all the photographs of the negative corresponding to odd numbers are printed at the lower exposure opening. The loop *g* of the negative film *b* is smaller than the loop *d* of the sensitive film *a*, thus producing a longitudinal shifting of one film with respect to the other between the upper and lower openings. It will be obvious that in case the intermittent feeding devices at the two openings 4 and 5 move simultaneously in the same direction the loop *g* may be dispensed with but the film *a* will still be provided with a loop *d* so that the relative shifting of the two series of pictures will be obtained.

5 shows the negative *b* of the usual type, the objects photographed being shown as a bird flying toward the left over a steeple and the photographs occur in a continuous, straight line, numerical sequence. Fig. 6 shows the positive which will be obtained from the said negative wherein the pictures are arranged in two arithmetical series the members of which alternate and in which one series is shifted so that its pictures are preceded by pictures of the other series which are representative of later phases of motion, as is clearly shown by the different positions of the bird.

The operation of the apparatus is as follows: The films *a* and *b* are threaded through the apparatus in a manner shown in Fig. 4 so that the odd numbered pictures of the negative will be printed at the lower exposure opening and the even numbered pictures at the upper exposure opening. The two films are moved together by the teeth 33 alternately at each opening a distance equal to twice the height of the said openings, the periods of rest occurring during the interval when the cut-away portions of the shutters 6 and 7 permit the light to fall upon said openings, and the result is that the impressions received upon the film *a* at the opening 4 will be separated by blank spaces, which spaces will be filled in at the opening 5 and by reason of the loop *g* being of different size from the loop *d*, the pictures of one series, that is, those printed at one opening, will be preceded by pictures printed at the other opening which are representative of later phases of movement.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is as follows:—

1. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings, whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

2. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across

said openings and intermittently bringing the same to rest at each opening, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings, whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

3. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings and intermittently bringing the same to rest at each opening, said intermittent feed operating to move the two films at each step a distance equal to the length of a plurality of adjacent pictures greater than one, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings, whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

4. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and means for causing a longitudinal shift of one film relatively to the other a distance equal to the length of an integral even number of pictures between said pair of exposure openings, substantially as set forth.

5. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and intermittently bringing the same to rest at each opening, the feeding means being so arranged with relation to the films as to bring odd numbered sections of the films to rest in front of one opening, and moving the same past the other opening without stopping, and even numbered sections of the films to rest in front of the last named opening, and moving the same past the first named opening without stopping, substantially as set forth.

6. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and intermittently bringing the same to rest at each opening, the feeding means being so arranged with relation to the films as to bring odd numbered sections of the films to rest in front of one opening, and moving the same past the other opening without stopping, and even numbered sections of the films to rest in front of the last named opening, and moving the same past the first named opening without stopping, and shutters for said openings, and means for operating said shutters timed to expose said films while the same are at rest only, substantially as set forth.

7. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and intermittently bringing the same to rest at each opening, the feeding means being so arranged with relation to the films as to bring odd numbered sections of the films to rest in front of one opening, and moving the same past the other opening without stopping, and even numbered sections of the films to rest in front of the last named opening, and moving the same past the first named opening without stopping, and shutters for said openings, and means for operating said shutters time to expose said films while the same are at rest only, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

This specification signed and witnessed this 18th day of December, 1905.

FRANK L. DYER.
DELOS HOLDEN.

Witnesses:
J. F. RANDOLPH,
MINA C. MACARTHUR.

700 a/

Correction in Letters Patent No. 970,614.

It is hereby certified that in Letters Patent No. 970,614, granted September 20, 1910, upon the application of Frank L. Dyer, of Montclair, and Delos Holden, of Upper Montclair, New Jersey, for an improvement in "Apparatus for Printing Moving-Picture Films," an error appears in the printed specification requiring correction as follows: Page 1, line 85, the word "alteration" should read *alternation*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of October, A. D., 1910.

[SEAL.]

E. B. MOORE,

Commissioner of Patents.

E. L. GREENSFELDER.

METHOD AND APPARATUS FOR SYNCHRONOUSLY PRODUCING SOUNDS TO ACCOMPANY MOTION PICTURES.

APPLICATION FILED MAR. 30, 1916.

1,254,684.

Patented Jan. 29, 1918.

4 SHEETS—SHEET 1.

Fig. 1.

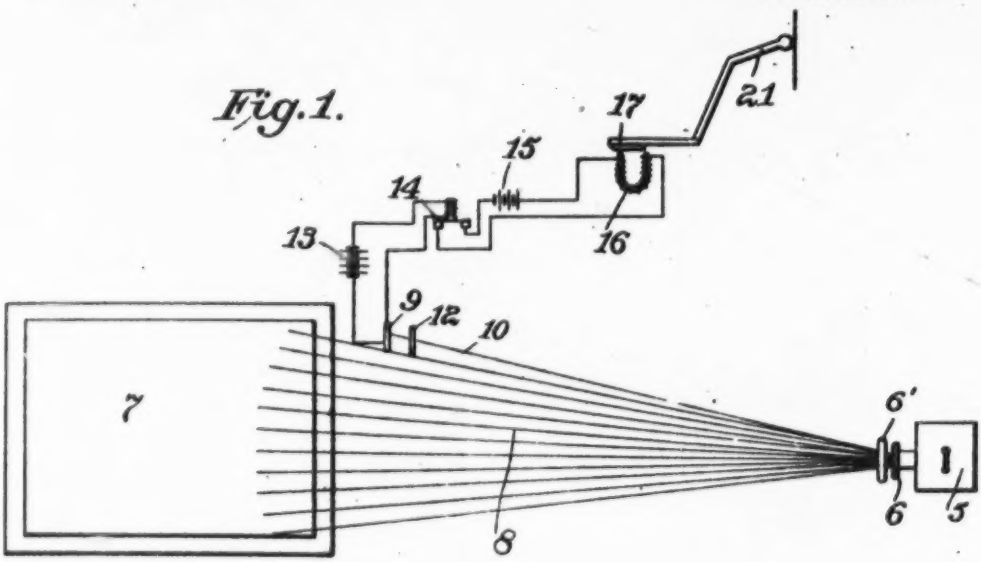


Fig. 2.

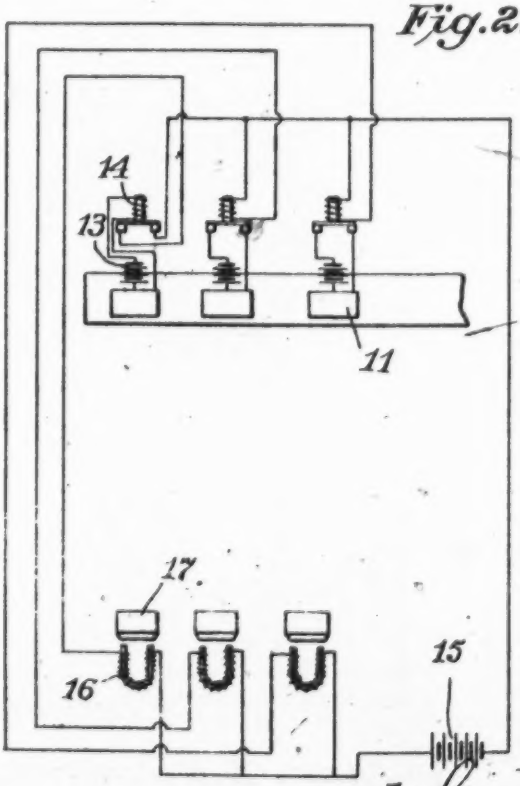
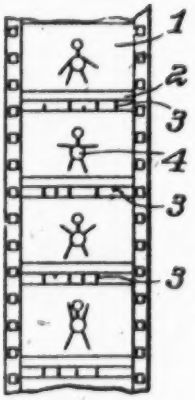


Fig. 3.



Inventor:
Elmer L. Greensfelder,
by Spear Middleton, Donaldson & Spear
Attys

E. L. GREENSFELDER.

METHOD AND APPARATUS FOR SYNCHRONOUSLY PRODUCING SOUNDS TO ACCOMPANY MOTION PICTURES.

APPLICATION FILED MAR. 30, 1916.

1,254,684.

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4 SHEETS—SHEET 2.

Fig. 4.

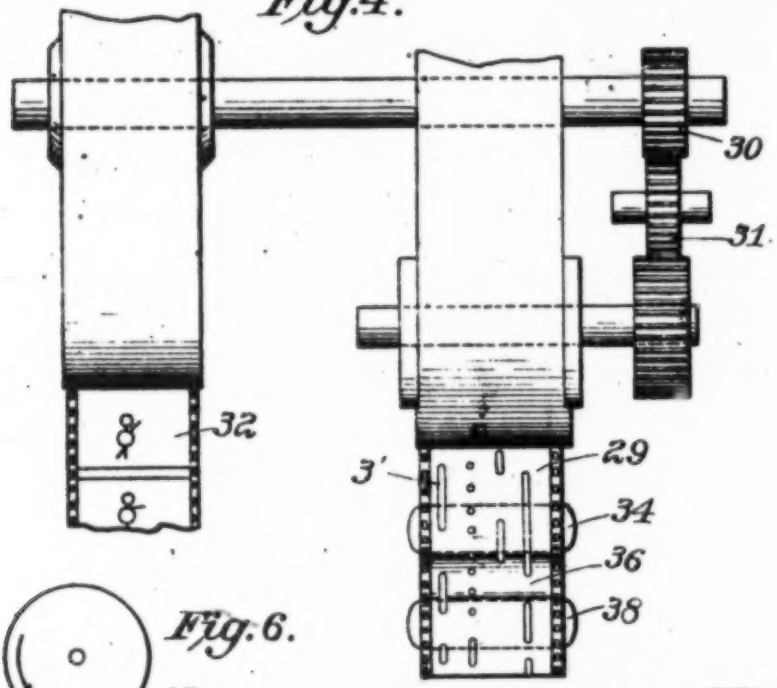


Fig. 6.

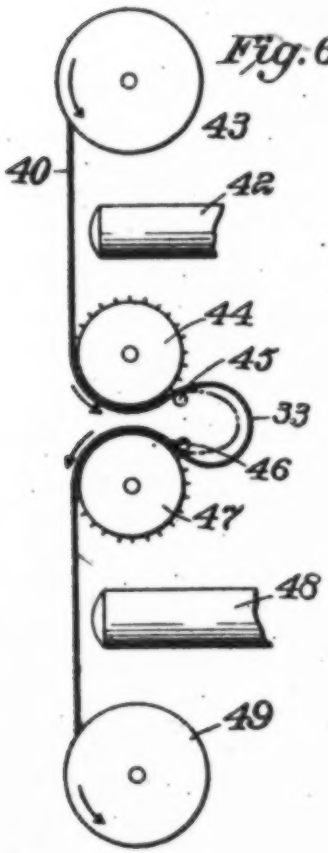
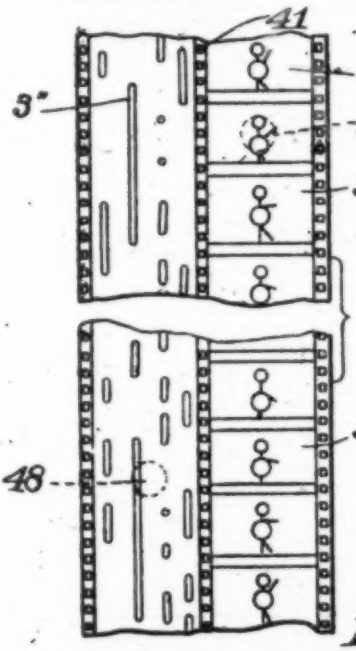


Fig. 5.



Inventor:

Elmer L. Greensfelder:

by Spear, Middleton, Marshall & Spear

Attys.

E. L. GREENSFELDER.

METHOD AND APPARATUS FOR SYNCHRONOUSLY PRODUCING SOUNDS TO ACCOMPANY MOTION PICTURES.

APPLICATION FILED MAR. 30, 1916.

1,254,684.

Patented Jan. 29, 1918.

4 SHEETS—SHEET 3.

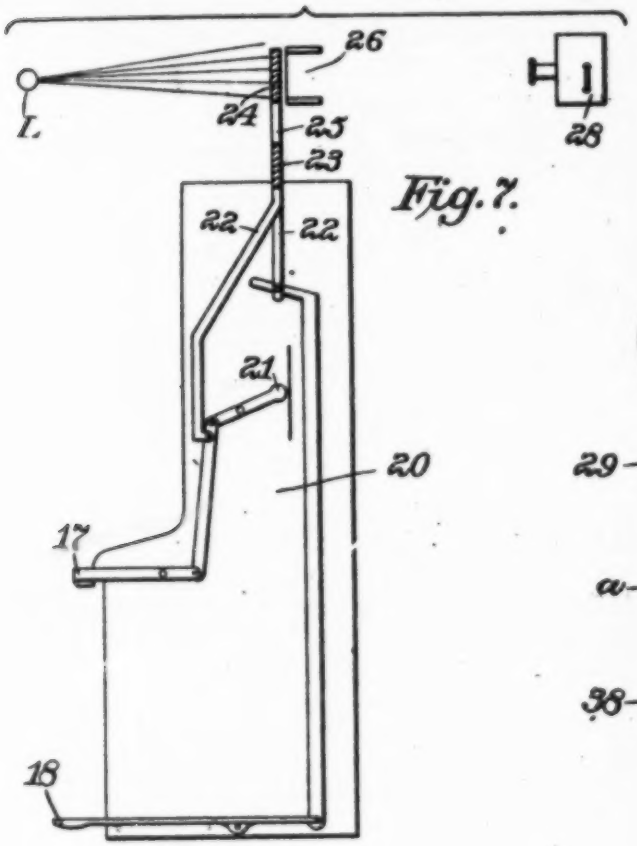


Fig. 7.

Fig. 9.

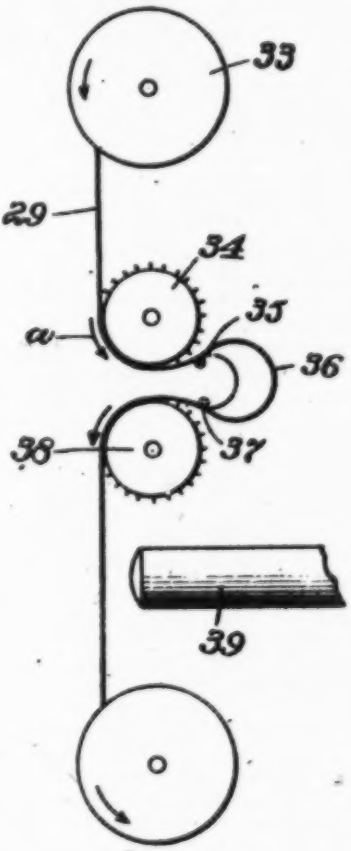
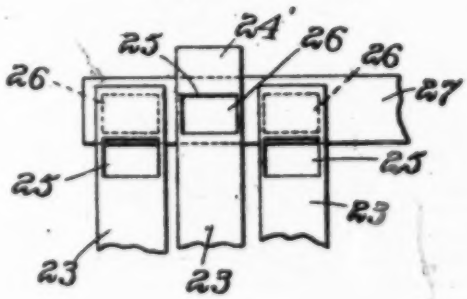


Fig. 8.



Inventor:

Elmer L. Greensfelder,

by Spear, Middleton, Donaldson & Spear

Attys.

E. L. GREENSFELDER.

METHOD AND APPARATUS FOR SYNCHRONOUSLY PRODUCING SOUNDS TO ACCOMPANY MOTION PICTURES.

APPLICATION FILED MAR. 30, 1916.

1,254,684.

Patented Jan. 29, 1918.

4 SHEETS-SHEET 4.

Fig. 10.

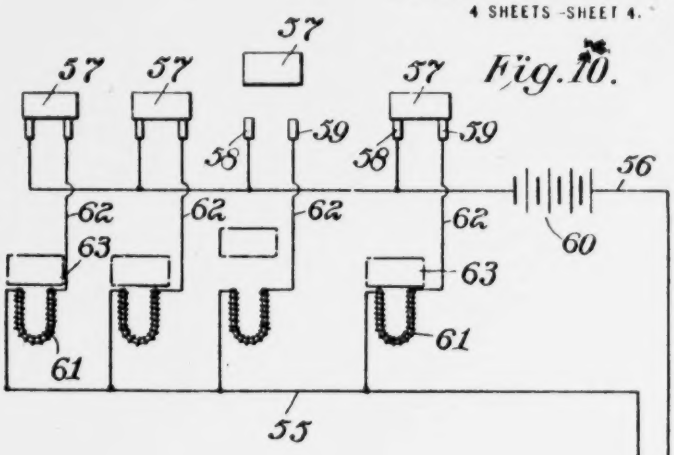
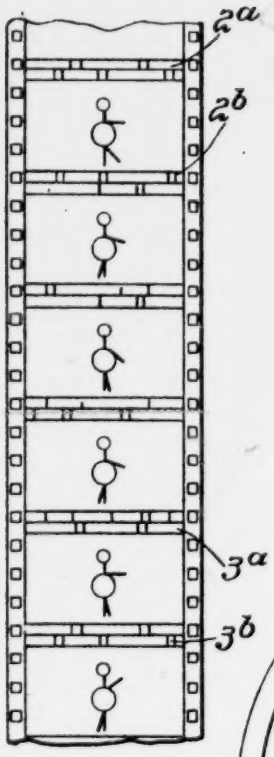


Fig. 11.



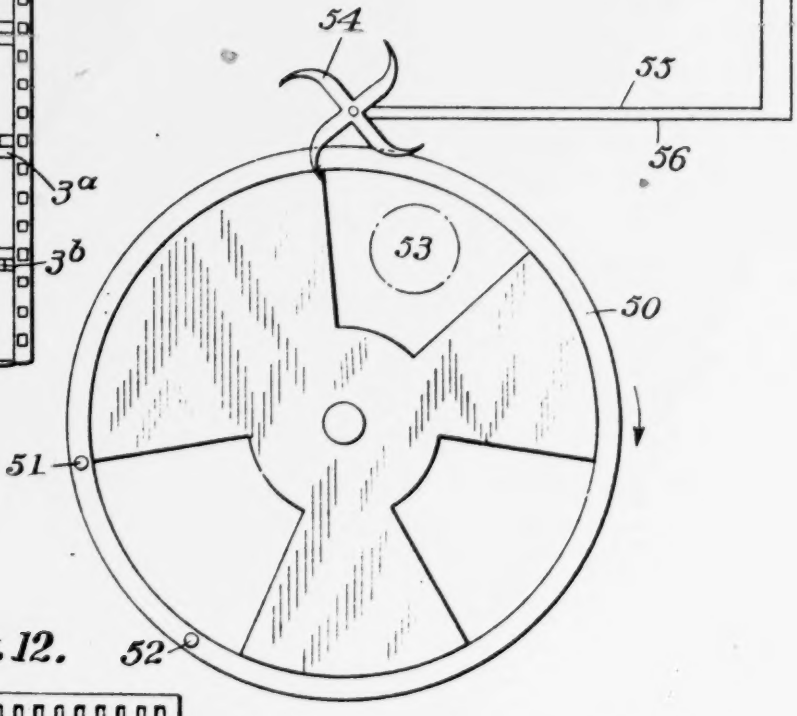
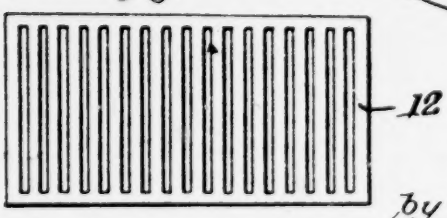


Fig. 12.



Inventor:

Elmer L. Greensfelder,

by Spear Middleton, Denardo & Spear

Atty's

UNITED STATES PATENT OFFICE.

ELMER LEWIS GREENSFELDER, OF BALTIMORE, MARYLAND.

METHOD AND APPARATUS FOR SYNCHRONOUSLY PRODUCING SOUNDS TO ACCOMPANY MOTION-PICTURES.

1,254,684. Specification of Letters Patent. Patented Jan. 29, 1918.

Application filed March 30, 1916. Serial No. 87,788.

To all whom it may concern:

Be it known that I, ELMER L. GREENSFELDER, a citizen of the United States, and residing at Baltimore, Maryland, have invented certain new and useful Improvements in Methods and Apparatus for Synchronously Producing Sounds to Accompany Motion-Pictures, of which the following is a specification.

The present invention relates to an improved method of producing different sounds during the projection of motion pictures upon the object screen. As is customary at present, while the pictures are being shown upon the screen, the orchestra plays appropriate musical selections. In order to produce a more realistic effect the music is generally chosen and conducted so as to give added expression to the actions and descriptive scenes being reproduced in pantomime on the screen. Unusual sounds, such as the report of a gun, the shriek of a whistle, the clatter of horses' feet, the cry of a child, the ringing of a bell, etc., all of which add greatly to the vividness of the scene, are generally assigned to one of the men in the orchestra to be reproduced as nearly in synchronism with the corresponding action in the picture as possible.

The object of the present invention is to provide an improved method whereby these various supplemental sounds, or even the piano accompaniment will be produced by the various instruments in exact synchronism with the reproduction on the picture screen of the scene of which they are illustrative.

The invention consists in providing a system of control for these several instruments which will be automatically operated by the picture film itself. It consists, more specifically, in photographing on the film a series of lines, or marks, disposed parallel to the length of the film, and suitably positioned in relation to the individual pictures of the scene being reproduced, to accompany the action or description which it is desired to have emphasized by the corresponding sound. These lines or marks are made transparent, white, or translucent on a darkened background. The lines may each represent one note of a piano (in the case of a piano record), while others may represent an expression lever, a sustaining pedal, or the operating mechanisms, or instrumentalities for beating a drum, ringing a bell, blowing a whistle, or producing like noises. The light from the motion picture machine passes through these transparent "sound marks" as the film is being shown on the screen. These light rays are intercepted between the lens of the machine and the screen, or at the screen, and caused to fall upon a series of exposed, separate, selenium cells. An individual selenium cell is provided for each "sound mark" of the film and each ray of light is directed by a system of slots and guides to exactly register with its corresponding cell. These cells are in turn each connected with a separate relay, electric battery and electro-magnet, the latter being so placed as to mechanically operate the sound instrumentality upon its becoming energized.

The invention further contemplates the provision of a method by which the musical instruments may be controlled and instrumental selections rendered separately and independently of the pictures, as for example, during the intermission of performances, or at any desired time or place.

The invention includes among other objects suitable arrangements and connections, whereby the sound producing instruments may be located near the screen or at a point sufficiently remote from the motion picture machine to produce the desired effects upon the audience.

The invention, while embodying in all of its forms the main principles of operation above set forth, may be varied somewhat to adapt itself to different kinds of machines. For example as previously pointed out, the "sound marks" may be placed on the picture film and be operated by the intermittent feed of the machine. Besides this method the "sound marks" might be formed on a separate reel of film adapted to have a continuous motion and geared to the sprocket turning the picture reel. Again a continuous method of projecting the "sound marks" may be employed in which a widened reel is used, on one side of which are the "sound marks", while the pictures occupy the remaining space.

With these and other objects in view the invention consists in the combination and arrangement of parts more fully described in the following specification, illustrated in the accompanying drawings and pointed out in the appended claims.

In the drawings the various methods by which the invention may be put into practice are illustrated diagrammatically by a series of views suggesting the arrangement and use of the several forms of apparatus employed.

In the drawings:—

Figure 1 is a diagrammatic view illustrating one embodiment of the present invention.

Fig. 2 is a diagram showing the electrical connections for the same more in detail.

Fig. 3 is a portion of a film of usual type having one arrangement of "sound marks" photographed thereon.

Fig. 4 illustrates diagrammatically a modified arrangement involving the use of two separate films driven synchronously.

Fig. 5 is a diagrammatic plan view illustrating a further modified arrangement involving the use of a double width film.

Fig. 6 illustrates the arrangement of Fig. 5, shown in side elevation.

Figs. 7 and 8 illustrate diagrammatically in side and front elevational views respectively the apparatus used in recording the "sound marks" on a film.

Fig. 9 illustrates diagrammatically take-up mechanism used to move the film at a constant speed before the projecting apparatus.

Fig. 10 illustrates diagrammatically an arrangement for sustaining the connecting of the electric circuits until the next consecutive row of "sound marks" is before the projecting lens.

Fig. 11 is a modified form of film.

Fig. 12 illustrates the screen 12.

The invention will first be described in connection with the method illustrated by the diagrammatic views, Figs. 1, 2 and 3, in which a series of "sound marks" are recorded on a small section of the ordinary picture film. Fig. 3 shows a fragmental strip 1 of an ordinary motion picture film, having the usual transverse sections 2 on which there is no photograph or marking. In addition this view shows horizontal rows of "sound marks" 3, located immediately above the picture 4 and below the section or blank strip 2. It is obvious that the "sound marks" 3 could be located equally well below the picture rather than above. These "sound marks" consist of a series of translucent, transparent or white spaces, photographed on a darkened surface in the form of parallel lines extending in a direction parallel to the length of the film. The purpose of these "sound marks" is to permit rays of light from the lens of the projecting machine to pass through when the picture film is being projected upon a screen. The manner in which these lines or "sound marks" are photographed on the film will be described in detail in another part of this specification. Fig. 1 illustrates diagrammatically the relative position and arrangement of all the instrumentalities employed in the use of an ordinary film carrying the "sound marks" 3 thereon at intervals between the pictures. The projecting motion picture machine 5, with its lens 6 and shutter 6′ is suitably located so as to project the pictures on the object screen 7, 8 representing the cone of light rays passing from the lens to the screen. A shelf 9 is placed at a suitable point between the lens 6 and screen 7, or at the screen 7, so as to intercept the rays of light 10 coming from the film through the "sound marks" 3. The shelf 9 contains a plurality of selenium cells or plates 11 arranged in a horizontal row corresponding in number and arrangement to the "sound marks" 3 on the film. A slotted screen or grating 12 may be properly positioned in front of the shelf 9 for the purpose of reducing the magnified light rays coming from the "sound marks" and preventing overlapping of the rays on the selenium surfaces. Each particular "sound mark" 3 on the film has a corresponding selenium cell 11 on the shelf 9, upon which it is adapted to impinge a ray of light as it passes between the light source and the lens of the projecting machine. When, for example, it is desired to apply the invention for the purpose of operating a player piano, eighty-eight "sound marks" 3 are provided, one for each note of the piano and additional "sound marks" for expression levers. The number and arrangement of these "sound marks" can be varied at will according to the number and variety of sound instruments it is desired to operate.

As previously pointed out, the rays of light 10 being dispersed and directed through the "sound marks" 3 and then reduced by the slits of the grating 12, are directed upon the corresponding selenium cells 11. These latter are each connected with a battery 13 in series with a corresponding relay 14, which in turn are connected through a second battery 15, each to a corresponding electro-magnet 16 adapted to operate a control lever 17 of a piano key, expression pedal, drum stick or other sound producing instrument. It is well known that selenium, when exposed to a concentrated ray of light, changes its conductivity with a resultant lowering of its electrical resistivity. This electro-physical change is relied on for the purpose of closing the electric circuit, including battery 15 and the energization of the corresponding electro-magnet.

The exact system of electrical connections may be varied by providing, for instance, a single battery instead of the individual ones 13 to operate any of the selenium cells 11 on which the light might fall, or again battery 15 could be replaced by a number of small

batteries, one for each relay. Again either battery 15 or batteries 13 could be replaced by a source of current, such as the house current, connected through a transformer.

The position of the shelf 9, containing the selenium cells 11, can be placed at any arbitrary point in the path of the light rays coming through the "sound marks" 3, either at or near the screen 7, or at a point about midway between the screen and the lens (as shown in Fig. 1), or near the operator's room. In order to effect the different locations of the shelf 9, a mirror may be placed in the path of the projected light rays so as to reflect them at any desired angle. A special lens may be placed near the projecting camera, through which the light rays are passed and dispersed so as to allow the shelf 9 to be placed within a comparatively short distance of the projecting lens of the motion picture machine.

Instead of using a separate selenium cell for each "sound mark" as proposed, a single structure may be used with an exposed selenium surface which is divided lengthwise electrically into as many sections as there are sounds and expressions to be operated by tapping off at regular intervals and connecting separately with the sources of current, relays, electro-magnets and corresponding sound instruments and expression levers to be operated. A shelf of thin partitions placed before the subdivided selenium surface would prevent the interference of the light ray coming from a "sound mark" with any selenium surface subdivision except its corresponding one.

The method of photographing the "sound marks" 3, as used in the method illustrated in Figs. 1 to 3, will next be described in detail and reference is made to Figs. 7 and 8 of the drawing. The rows of "sound marks" are photographed onto the picture film by a motion picture camera, the film of which is moved intermittently as is done in photographing an ordinary motion picture scene. It is absolutely necessary that the film be moved, while the "sound marks" are being photographed, at exactly the same speed at which the picture film, of which they are to control the accompanying sounds and music, is moved. By way of illustration, Figs. 7 and 8 show the manner of photographing the "sound marks" to record the notes of music played upon a piano. Each key 17 or expression pedal 18 of a piano 20, or other instrument the sound of which is to be recorded, operates a hammer 21, or corresponding part of another instrument, and at the same time moves a rod 22, which in this case is moved vertically. At the upper end of the rod 22 a plate 23 is carried, provided with blind or shuter part 24 and a corresponding opening 25 located immediately below the same. The plate 23 is adapted to normally remain in its lowered position with the shutter 24 intercepting the rays of light from any suitable source L and preventing them from registering with an aperture 26 formed in a horizontal shelf 27. A motion picture camera 28 is suitably positioned behind the shelf 27 in line with the series of apertures 26. As the key or pedal of the piano operates the hammer 21, the rod 22 and plate 23 are moved so as to bring the opening 25 opposite the aperture 26 and allow the light from the source L to pass therethrough and be photographed by the motion picture camera 28. The film of the camera 28 must be moved at the same speed for the purpose of photographing the "sound marks" 3, as when the camera is used for the purpose of photographing the corresponding scene to be reproduced. While the "sound marks" 3 are being made by photographing the light intermittently passing through the aperture 26, the picture part of the film in camera 28 is screened by a blind or shutter so as to remain unexposed. In this manner the "sound marks" 3 are photographed only on the narrow strip of the film shown in Fig. 3.

In order to secure the best results it has been found advisable to have a motion picture positive properly pieced and joined so as to be ready for projecting and exhibiting before recording on the film in camera 28 the rows of "sound marks" that are to accompany the animated picture. This positive should contain on it blank spaces in the position of 3, Fig. 1. On the completed positive ready for the market these blank spaces will be filled in by rows of sound marks, and the spaces for the pictures by the pictures, which can be effected by such a method as printing the positive from the two superimposed negatives, as will be hereinafter described. The pianist or musician, who is to play the accompaniment to be recorded for the picture, watches the positive picture as it is projected on the screen before him from a motion picture apparatus at a definite speed. After he has become familiar with the picture, the positive is again projected through the motion picture apparatus and he then plays the accompaniment to the picture, introducing whatever melodies, chords, compositions or sound effects he thinks appropriate to the action of the objects or characters in the picture. The instrument which he operates is connected and controlled by the mechanisms just described in connection with Figs. 7 and 8, and the "sound marks", corresponding to the sounds and expressions produced, are recorded on the film of camera 28, it being understood that this camera is operated at precisely the same speed at which the picture projecting machine was operated. A developed negative containing the rows of "sound marks", but on which the spaces for the pictures are blank, is superimposed upon

a developed negative properly pieced and joined and having the pictures photographed thereon but having spaces for the "sound marks" left blank, and a print is made from this combined negative which will give a positive containing the pictures 4 and the corresponding rows of "sound marks" 3, shown in Fig. 3.

Another method by which these rows of "sound marks" 3 may be recorded so as to appear as shown in Fig. 3, is by making a marked or perforated roll of the music and sounds, such as is used in player pianos and automatic musical instruments. This roll is then moved in the direction of its length at the proper speed and is photographed through a slit by a motion picture camera, on the film of which the spaces for the pictures are not exposed to the light. The finished positive containing the pictures and "sound marks" in their proper positions may then be made by superimposing two negatives, as above described.

The method of photographing the "sound marks" 3 by the use of the motion picture camera necessarily involves a series of intermittent exposures, due to the operation of the motion picture camera shutter. It will be seen that some of the notes so photographed or marked will be of such length as to be recorded by "sound marks" extending over several consecutive pictures, while others may be of such brief duration as to be represented by "sound marks" contained on only one or two consecutive pictures. It is necessary to have the individual electric circuits so adjusted as to be sufficiently sluggish and therefore not disconnect the current when a certain "sound mark" is continued over two or more consecutive pictures, otherwise the note or sound which was intended to be sustained would not be reproduced continuously. On the other hand, the circuits must be so adjusted as to disconnect whenever their corresponding "sound mark" does not accompany a picture.

One method by which the circuits operating the electro-magnets can be made to hold over without disconnecting the current until the next consecutive row of "sound marks" is in position before the lens, is illustrated by the use of the apparatus shown in Fig. 10. The shutter 50 is equipped with two lugs 51 and 52 located as shown in Fig. 10, so that when the shutter 50 revolves before the projecting lens 53 they operate a switch 54 which makes and breaks the current flowing through wires 55 and 56. Lug 51 closes the circuit so that the electro-magnets energized by the "sound marks" 3 on the picture before the projecting lens remain energized until the film has passed behind the shutter and the next consecutive picture and row of "sound marks" is before the projecting lens; then lug 52 disconnects the current, at which moment light from the next row of "sound marks" is projected to the selenium cells. Each note, expression lever or sound hammer 57 when operated or sounded makes contact with separate contact points 58 and 59. Contact points 58 are connected by a battery 60 or other source of current to the switch 54 at the shutter and the other wire 55 running from the switch 54 connects with a pole of each electro-magnet 61. The other pole of each electro-magnet is connected by a separate wire 62 to its respective contact point 59. 63 shows the positions of the keys when a piano is used. By this method whenever a sound or expression instrumentality is operated or sounded, each of the particular sounds or expressions is sustained until the next consecutive row of "sound marks" is in position before the projecting lens. The sustaining of the sounds and expressions is effected while the light falling on their corresponding selenium cells is screened off by the opaque sections of the shutter.

A further method of keeping the electro-magnet circuits from disconnecting until the next consecutive picture is in proper position before the lens, is to have the film made with the "sound marks" recorded thereon as shown in Fig. 11. This form of film is practically the same as that shown in Fig. 3, except that in the present form there are additional rows of "sound marks" 2^a, 2^b, etc., in the spaces which, in ordinary films, exist between the pictures. The "sound marks" 2^a are the same as those indicated at 3^a and the "sound marks" at 2^b are the same as those indicated at 3^b, etc. These identical rows of "sound marks" are always separated by the same number of pictures. In allowing the rays of light to pass through the "sound marks" a secondary projecting lens is used which is also focused on the selenium cells. This secondary lens is used only for the "sound marks" 2^a, 2^b, etc., and the main projecting lens is used to allow the rays of light to pass through the "sound marks" 3^a, 3^b, etc. As the rays of light from main lens passes through the "sound marks" 3^a, "sound marks" 2^a appear in position before the secondary lens. As soon as the shutter is about to screen off marks 3^a then the rays of light from the secondary lens passes through 2^a and thus the identical marks are projected and superimposed on the selenium cells. This row of marks 2^a remains before the secondary lens until 3^b have replaced 3^a before the main projecting lens, then a shutter screens off 2^a and in a similar manner 2^b next appear before the secondary projecting lens. In this manner, although the film is moving intermittently before the main lens, yet the selenium cells are properly kept in the path of the light until the next row of "sound marks" is in position before the main lens.

By the methods just described the action in the motion picture will be synchronous with the accompanying sounds. Should the film break, as happens in operating motion picture machines now in use and should the operator piece together the broken film, the sound and action on the mended film will still remain synchronous, even though one or more pictures of the film be left off as the corresponding "sound marks" for the accompanying sound will have been removed with the pictures.

The method in which the "sound marks" are photographed on a separate film adapted to be continuously driven and geared to the sprocket turning the picture film will next be described. As shown in Fig. 4, a separate film 29 is used for the "sound marks" and instead of having them formed in rows between the pictures, as described in connection with Figs. 1 to 3, the marks for each note, expression element or sound instrument are continuous. The "sound marks" 3′ consist of transparent marks parallel to the direction of the length of the film and vary in length in direct proportion to the length or duration of the sound which they represent. Here the "sound marks" 3′ are similar in appearance to the slits or perforations of the ordinary music roll used in player pianos and automatic musical instruments of that type. This sound film 29 can be photographed from an operating piano or mechanism, such as illustrated in Fig. 7 and described in connection therewith, except that the reel in the photographing camera 28 must move before the lens at a constant continuous speed and not intermittently and with no shutter interference. This can be done by removing the shutter and intermittent sprocket mechanism of the ordinary motion picture machine. As described in connection with the method illustrated in Figs. 1 to 3 and 7 and 8, this film may be made by first making a perforated roll of the sound accompaniment, such as is used for player pianos and then while this roll is moving in the direction of its length and at the proper speed, photographing it through a slit by a motion picture camera from which the shutter and intermittent sprocket mechanism have been removed. The mechanism holding the film 29, having the "sound marks" photographed thereon, is geared to the sprocket 30, by suitable mechanism 31, of the picture film 32, or it is geared to a mechanism adapted to turn the sound film at the same speed at which it was moving when photographed and thus produce the sounds synchronously with the accompanying pictures. It will be understood that separate lenses are used for the purpose of projecting the pictures of the film 32 and the "sound marks" 3′ of the film 29. The film 32 will operate in the intermittent manner before the projecting lens used in exhibiting motion pictures and will be thus projected to the screen. The accompanying sound film, however, must move at a constant continuous speed before the lens, which is to project the rays of light through the "sound marks" 3′ on to their respective selenium cells. This can be effected by a take-up mechanism shown in section in Fig. 9. Here the film of "sound marks" 29 unwinds from the spool 33 at an intermittent speed proportionate to the intermittent speed of the picture film 32 to which it is geared. It then passes over sprocket 34 behind a guide bar 35 to form a loop 36 back of a second guide bar 37 and over a second sprocket 38 and then moves at a constant continuous speed in front of a projecting lens 39, which projects and disperses the rays penetrating the "sound marks" 3′ to their corresponding selenium cells located in the path of these rays and connected to their corresponding source of current, relay, electromagnets, and sound producing instruments, as hereinbefore described. If the sprocket 38 is turning at a constant continuous speed it will allow the sound film to pass at such speed before its projecting lens 39, while the loop 36 of the film will decrease and increase in size and supply sufficient lengths of the film, to permit of this constant continuous speed over sprocket 38 and yet allow the film to pass intermittently over sprocket 34 in the direction of the arrow *a*.

Should the sound or picture film described in this method break, to maintain synchronism in the operating of the two films, it would be necessary in repairing the broken film to add a proportionate amount of blank film and thereby keep both films of the original proportionate length.

Referring to Figs. 5 and 6, the invention is shown as applied to a film of double width, one-half of which contains the pictures 38 while the other half contains the "sound marks" 3² formed similarly to those illustrated and described in connection with Fig. 4: The film 40 in this instance, is provided with an additional row of perforations 41 to fit cogs on the mechanism in order to prevent buckling of the film in operating it through the projecting machine. The film could be made in a manner similar to that described in connection with the method illustrated by Fig. 4 but it will be necessary in projecting this film to have the "sound marks" moved at a constant continuous speed before its projecting lens while the pictures must be moved before the lens which projects them in the intermittent manner usually employed in projecting motion pictures. A convenient way to obtain the film 40 is to first photograph a negative of the original sound film and place it side

by side with a finished and pieced negative of the corresponding picture film, then from the two print a one piece double width positive, such as shown in Fig. 5. The "sound marks" do not necessarily have to be immediately opposite or adjacent to the particular picture or pictures which they are to accompany in order to have synchronism between the two in projecting. The "sound marks" 3' do not pass in front of the lens 42 but to one side of it and consequently are not projected by it. The lens 42 is used to project the pictures as the film 40 comes from the reel 43. After passing the lens 42 the film passes over a take-up mechanism similar to that shown and described in connection with Fig. 9, except that in the present case the sprocket 44, bars 45 and 46, and sprocket 47 are broad enough to accommodate the widened film containing both the pictures and the "sound marks" adjacent to one another. From the take-up mechanism the film passes before the lens 48 and is wound upon reel 49. Lens 48 is used for projecting the rays of light through the "sound marks" and is offset to one side of lens 42. On passing over the sprocket 47 the film is moved at a constant continuous speed instead of intermittently as when passing before lens 42. It will thus be seen that from this arrangement the pictures 38' are intermittently fed so as to be projected by the lens 42 while the "sound marks" 3' are passing simultaneously to one side of the lens and therefore not receiving light therefrom. Then later as the film moves with a continuous constant motion before lens 48, the rays of light pass through the "sound marks" 3' while the pictures are moving to one side of the lens and receive no light therefrom.

Should the operator have reason to mend a broken film, such as is used in this method, the synchronism of sound and action will not be destroyed in operating the mended film, for every section of the picture film removed a corresponding length of the sound film could be removed.

While I have shown the present invention as applied for the purpose of reproducing sounds, such as the playing of a piano, etc., it is to be understood that the invention is not limited to the particular examples illustrated and described in the present case, as various other instruments and sound producing mechanisms can be equally well operated by the use of this method, the electromagnets either depressing the notes and expression pedals as described or controlling stops in front of tracker-board apertures in electrically operated instruments.

Having described my invention what I claim is:—

1. The hereindescribed method of producing musical sounds and the like synchronously with the actions in a motion picture film that is being projected, consisting in photographing upon a film sound marks in given relation to the pictures, simultaneously projecting the pictures and rays of light through the sound marks, whereby the pictures will be thrown on a screen and the light from the sound marks will be directed upon selenium cells to close electric circuits and operate suitable sound producing instruments.

2. The herein described method of producing musical sounds and the like synchronously with the actions in a motion picture that is being projected, consisting in photographing pictures on certain portions of a picture film, recording rows of sound marks on other parts of the film, and simultaneously projecting the pictures upon a screen and rays of light through the sound marks upon the light operated means controlling certain sound producing instruments.

3. Apparatus for synchronously producing musical sounds and the like to accompany the projection of motion pictures comprising, a film having picture scenes and sound marks photographed thereon, means for simultaneously projecting the pictures and rays of light through the sound marks, sound producing instruments, and light controlled means upon which the sound marks are projected for operating said sound producing instruments.

4. Apparatus for synchronously producing musical sounds and the like to accompany the projection of motion pictures comprising a film having sound marks and pictures contained thereon in a given relation, sound producing instruments, light operated means adapted to operate said instruments, and means for simultaneously projecting said pictures and rays of light through said sound marks onto said light operated means.

5. Apparatus for synchronously producing musical sounds and the like to accompany the projection of motion pictures comprising a picture film having sound marks thereon, sound producing instruments, electro-magnetic operating means therefor, electric circuits including said electro-magnetic means, light-operated means for closing and opening said circuits, and means for simultaneously projecting the pictures and light through the sound marks on to said light-operated means.

6. Apparatus for synchronously producing musical sounds and the like to accompany the projection of motion pictures comprising a picture film having sound marks thereon, sound producing instruments, electro-magnetic means for actuating said instruments, a plurality of selenium cells, electric circuits including said selenium cells and electro-magnets, and means for simul-

taneously projecting the pictures and rays of light passing through said sound marks on to said selenium cells for opening and closing said circuits.

7. A motion picture machine comprising in combination, a plurality of independently operable sound producing elements, and light operated means automatically controlled by the film for independently operating said elements synchronously with the actions of the pictures.

8. Apparatus for synchronously producing musical sounds and the like to accompany the projection of motion pictures comprising a picture-film having horizontal rows of transparent sound marks on sections thereof immediately preceding each picture, sound producing instruments, electro-magnetic means for actuating said instruments, a plurality of selenium cells, electric circuits including said selenium cells and electro-magnets, light operated means for opening and closing said circuits, said light operated means being adapted to be controlled by the rays of light through the sound marks.

9. Apparatus for synchronously producing musical sounds and the like to accompany the projection of motion pictures comprising a picture-film having horizontal rows of transparent sound marks on sections thereof between the pictures, sound producing instruments, electro-magnetic operating means therefor, electric circuits including said electro-magnetic means, light operated means for closing and opening said circuits, said light operated means being adapted to be controlled by the rays of light through the sound marks.

10. Apparatus for synchronously producing musical sounds and the like to accompany the projection of motion pictures comprising a film having picture scenes and sound marks photographed thereon, means for simultaneously projecting the pictures and rays of light through the sound marks, means for reducing the magnified light rays from the sound marks, sound producing instruments, and light controlled means upon which the sound marks are projected for operating said sound producing instruments.

In testimony whereof I affix my signature.

ELMER LEWIS GREENSFELDER.

H. C. BULLIS.

TALKING PICTURE APPARATUS.

APPLICATION FILED DEC. 15, 1915.

1,335,651. **Patented Mar. 30, 1920.**

2 SHEETS SHEET 1.

Fig. 1.

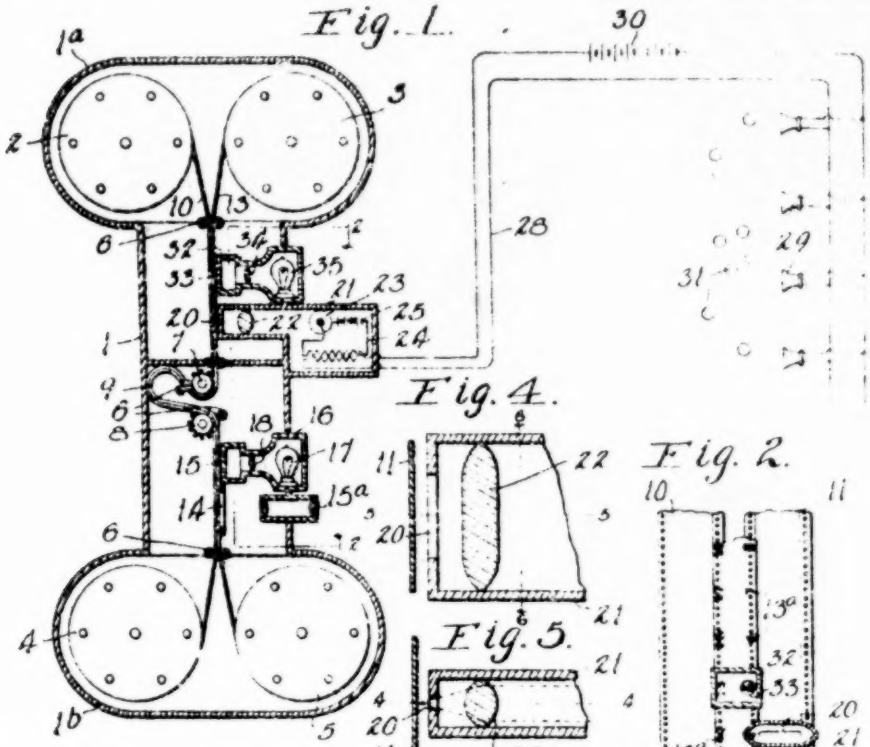


Fig. 4.

Fig. 5.

Fig. 2.

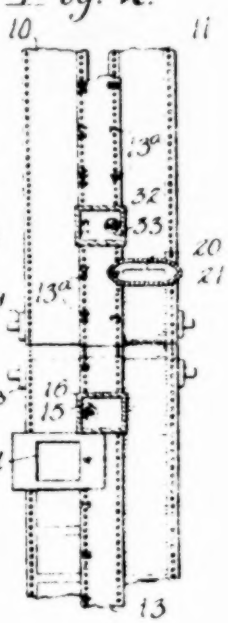


Fig. 3.

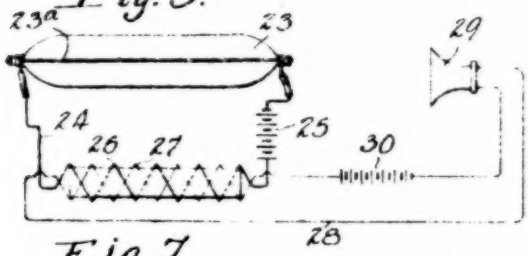
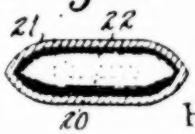


Fig. 7.

Fig. 6.



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TALKING PICTURE APPARATUS.

APPLICATION FILED DEC. 15, 1915.

1,335,651. **Patented Mar. 30, 1920.**

2 SHEETS—SHEET 2.

Fig. 8.

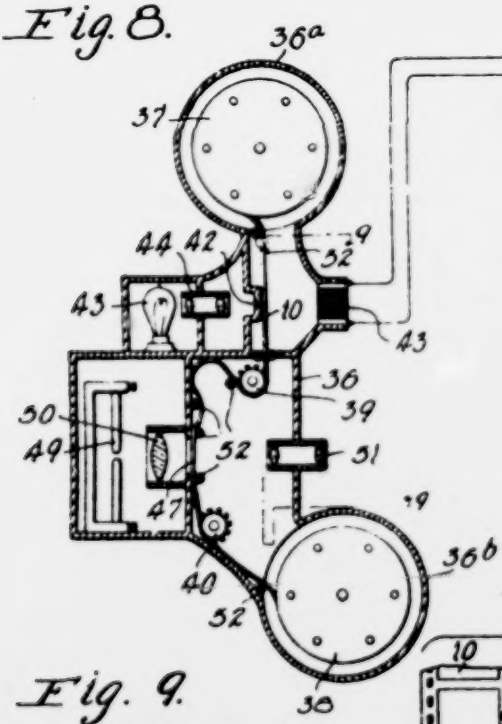


Fig. 11.

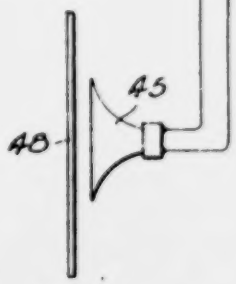


Fig. 9.

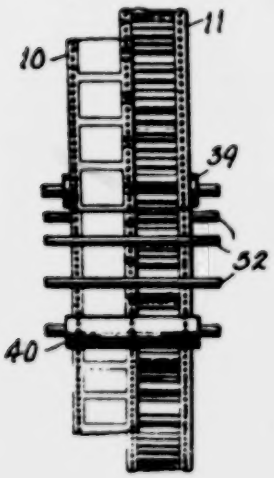
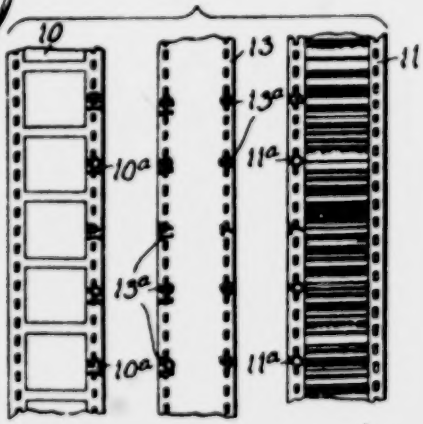


Fig. 10.



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TALKING-PICTURE APPARATUS.

1,333,651. Specification of Letters Patent. Patented Mar. 30, 1920.

Application filed December 15, 1915. Serial No. 67,090.

To all whom it may concern:

Be it known that I, HENRY C. BULLIS, a citizen of the United States, residing at Redwood Falls, in the county of Redwood, State of Minnesota, have invented a new and useful Talking-Picture Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to an apparatus for simultaneously taking and reproducing picture and sound records, thereby producing what are commonly termed "talking pictures", the object of the invention being to provide a device of this character which embodies novel features of construction whereby the picture record and sound record can be given the necessary individual treatment for developing them in the most effective manner and then readily assembled in such a manner as to bring the picture record and sound record in proper position to produce perfect synchronism when the pictures and sound are reproduced.

Further objects of the invention are to provide a device of this character which is comparatively simple and inexpensive in its construction, which admits of different emulsions and different treatments being employed in making the picture record and sound record, which provides corresponding identification marks upon the picture record and sound record so that there will be no difficulty in assembling the two records in the proper relation for the reproducing operation, which admits of the picture record and sound record being handled separately while being developed and subsequently joined together so as to produce a single film if such is desired, and which provides for reproducing the sound from a continuously moving portion of the film and the reproduction of the picture by an intermittently moving portion of the film.

With these and other objects in view, the invention consists in certain novel combinations and arrangements of the parts as will more fully appear as the description proceeds, the novel features thereof being pointed out in the appended claims.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:—

Figure 1 is a diagrammatic view of a form of apparatus suitable for simultaneously making the picture and sound records, the casing being shown in section.

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a detail view of the microphone controlled source of light which is used for making a photographic sound record upon the emulsion of the sound record film.

Fig. 4 is an enlarged horizontal sectional view through the lens and a portion of the casing which is used in connection with the microphone controlled source of light to make the sound record upon the film.

Fig. 5 is a vertical sectional view through the same on the line 5—5 of Fig. 4.

Fig. 6 is a transverse sectional view on the line 6—6 of Fig. 4.

Fig. 7 is a detail view of one of the cog wheels which is employed for moving the films through the record making apparatus.

Fig. 8 is a diagrammatic view similar to Fig. 1, showing the reproduction apparatus.

Fig. 9 is a sectional view on the line 9—9 of Fig. 1, showing the manner of assembling the two films in the reproducing apparatus.

Fig. 10 is a detail view of one of the toothed wheels used in the reproducing apparatus.

Fig. 11 is a detail view of portions of the picture film and sound film, together with a corresponding portion of the identification mark printing film, which is employed in connection with the two films when making the records.

Corresponding and like parts are referred to in the following description and indicated in all of the views of the drawings by the same reference characters.

In carrying out the present invention the picture record and sound record are made at the same time and by the same apparatus, but upon separate and distinct films. It has been previously proposed in this art to accomplish the result by making the picture record and the sound record upon the same film, although this is open to the objection that the proper emulsion, manipulation and development for obtaining the best results in the sound reproduction differ very materially from those required to obtain the

best results for the picture records. Where the two records are made upon the same film, using the same emulsion, it must be obvious that a proper treatment or development of one record can only be obtained at the sacrifice of the other record, since the special form of development required to get the best results from the two records would ordinarily be quite different. It will thus be seen that there are very important practical reasons why the two records can not be successfully and satisfactorily made upon the same film, as has been previously proposed, and it is the object of the present invention to overcome this particular objection, by providing a construction which admits of the records being made upon different films, which may have different emulsions, and may be individually treated in the development exactly as may be required to produce the best results. These two independent films have corresponding identification marks made upon the same at the time the two records are made, so that they can be assembled without difficulty in the proper manner necessary for a synchronous reproduction of the pictures and sounds.

Fig. 1 illustrates in a diagrammatic manner a form of apparatus adapted to be employed in making the picture and sound records. The numeral 1 designates the casing which is provided at the top thereof with a chamber 1^a within which are mounted the reel 2 from which the sensitized films are unwound and the reel 3 from which the opaque printing film is unwound, a similar chamber 1^b being provided at the bottom of the casing within which are mounted the reel 4 upon which the exposed films are wound and the reel 5 upon which the opaque printing film is wound. Suitable guide means 6 are provided at the top and bottom and intermediate points of the main portion of the casing 1 for holding the films and printing strip together during the record making operation. The numeral 7 designates the usual continuously rotating toothed roller and the numeral 8 the usual intermittently rotating toothed roller, the loop between the two rollers being indicated at 9. The conventional mechanism may be employed for operating these rollers and the picture taking mechanism, the portions of the films below the toothed roller 8 having an intermittent movement, while the portions of the films above the rollers 7 have a continuous movement.

The picture film 10 and sound film 11 are made separate and distinct from each other, and may be treated with the same emulsion, or with different emulsions, as found necessary to obtain the best results. The toothed rollers 7 and 8, one of which is shown in detail by Fig. 7, are each provided with four peripheral rows of teeth 12. The picture film 10 engages one set of the teeth 12, while the sound film 11 engages the opposite set of teeth 12, the two films being thus locked together and moved simultaneously through the machine. The printing strip 13 is arranged intermediate of the picture film 10 and sound film 11 and overlaps the adjacent inner edges of the two films, said printing strip being suitably perforated to engage the two inner rows of teeth 12 on the toothed rollers 7 and 8. This printing strip 13 is formed of opaque material, being provided at the edges thereof with transparencies 13^a in the form of identification marks. In the present instance numerals are employed, although any other suitable form of character might be substituted. These transparencies 13^a in the edges of the opaque strip 13 will, as hereinafter described, print corresponding identification marks 10^a and 11^a upon the picture film 10 and sound film 11, respectively. Inasmuch as the sound record must be made upon the continuously moving film above the loop 9, and the picture record upon the intermittently moving film below the loop 9, there will necessarily be a space between the corresponding transparencies 13^a on the opposite edges of the printing strip 13 in order that the portion of the sound record on the film 11 opposite an identification character 11^a may correspond to the picture opposite the same identification character 10^a on the picture strip. With the ordinary forms of moving picture machines, this interval would be ten spaces, so that similar transparencies 13^a on opposite sides of the printing strip 13 would be just ten spaces apart. Where numerals are employed, as in the present instance, there is a difference of ten units between those numerals directly opposed to each other on the printing strip, the numeral "7" being directly opposite the numeral "17", the numeral "8" directly opposite the numeral "18", etc.

The pictures are made in the usual manner through an aperture 14, a conventional form of lens 15 being shown as arranged in front thereof. Immediately above the aperture 14 is an aperture 15 arranged over the edge of the printing strip 13 and formed in one end of a suitable housing 16. The rays from a lamp 17 arranged within the housing are focused by a lens 18 upon the edge portion of the printing strip 13 which moves opposite the aperture 15. The various transparencies 13^a upon that side of the printing strip 13 which overlaps the edge of the picture film 10 are thus successively printed upon the edge of the picture film as the pictures are taken and the film advanced.

At a point above the loop 9 the sound film 11 moves across an aperture 20 in one end of a housing 21. This aperture 20 is in the form of a transverse slit (see Figs.

4, 5 and 6) and a laterally elongated lens 22 is arranged within the housing to focus the rays from a sound controlled source of light 23 through the slit 20 upon the sound film 11. The shape of the lens 22 is such as to focus the light rays in a transverse line, instead of in a point, although the slotted aperture 20 is essential to prevent what is termed halation. The intensity of the light rays from the source of light 23 varies with the sound, so that as the sensitized film 11 is moved past the aperture 20 the intensity of the light acting thereon will be continually changing, the variance in intensity being controlled by the sound which is to be reproduced. This result may be produced in different manners, although I have shown the source of light 23 as in the form of an incandescent bulb having a long filament 23ª arranged parallel to the slit 20. The circuit 24 for the lamp 23 includes a source of electrical supply 25 and one coil of an electro-magnetic coupler 26. Surrounding the coil 26 is another coil 27 arranged in the circuit 28 of a microphone or series of microphones 29, a suitable source of energy 30 being also arranged in the said circuit. In Fig. 1, a series of the microphones 29 are shown as arranged in series and mounted at the back of the stage, the possible position of different actors in front of the microphones being indicated by the small circles 31. The sound waves will act through the microphones to produce fluctuations of the current in the microphone circuit 28, and owing to the relation of the coils 26 and 27, the intensity of the current in the light circuit 24 will be caused to fluctuate by induction. The intensity of the light will vary with the strength of the current and, with the arrangement described, this will be controlled by the microphones. The connections in the electro magnetic coupling, constituted by the coils 26 and 27, in connection with the lamp and its source of energy, and the microphone and its source of energy, must be such that the inductive effect of the microphone circuit and its winding upon the coupling shall amplify the current flowing through the lamp and its winding in the coupling, thereby causing the loud sounds to produce dark striations upon the sound record film.

Arranged immediately above the housing 24 is a housing 32 having an aperture 33 in one end thereof and provided with a lens 34 and light 35. The rays from the light 35 are focused by the lens 34 through the aperture 32 upon that side of the printing strip 13 which overlaps the edge of the sound film 11. As the films are advanced the transparencies 13ª of that side of the printing strip are brought successively opposite the aperture 33 so that the characters [illegible] upon the edge of the sound film 11. It will be observed that the two printing apertures 15 and 33, respectively, are arranged just one step in advance of the picture taking aperture 14 and the sound record aperture 20, respectively, so that the identification characters are really printed upon the edges of the films before the picture record and sound record, although the relationship between the two films is maintained, so that the result is the same as though the identification characters were printed at the same time the records were made.

The exposed films 10 and 11 are developed separately, and each film may be manipulated and treated in the manner necessary to perfect the same to the best advantage, the identification marks printed through the transparencies in the edges of the opaque printing strip 13 appearing at intervals along the edges of the films, thereby enabling the two films to be subsequently reassembled without difficulty in the proper relation necessary to bring about a synchronous reproduction of the pictures and sounds. The pictures appear upon the picture film in the usual and well known manner, while the sound record appears in the form of a series of transverse striations of varying intensity. The result is a film with a ladder like strip of alternately dark and light zones merging into each other, as determined by the sound waves. From the original negatives positives for reproduction may be obtained in the usual manner by contact printing or otherwise.

One possible form of reproducing apparatus is shown by Fig. 8. The main casing 36 is provided at the top thereof with a chamber 36ª to receive the reel 37 from which the reels are unwound, and at the bottom thereof with a chamber 36ᵇ to receive the reel 38 upon which the films are rewound. The toothed roller 39 engages the films and rotates continuously, while the toothed roller 40 which is arranged below the roller 39 has an intermittent movement, said rollers being actuated by the usual mechanism. One of these rollers is shown in detail by Fig. 10, and it will be observed that they have three peripheral rows of teeth 41. For reproducing purposes there is no occasion to use the printing strip 13, and the inner edges of the picture film 10 and sound film 11 are overlapped and caused to engage the intermediate row of teeth 41. At a point above the continuously rotating toothed roller 39 the sound film 11 is moved across a slit or aperture 42 through which rays of light from a lamp 43 are focused upon the film by suitable lenses 44. The light acts through the sound film 11 upon a selenium cell 43, or some similar member arranged in the circuit 44 of a telephone receiver 45, a source of electrical energy 46

being arranged in the circuit. The striations upon the developed sound film 11 are of various degrees of density, so that the intensity of the light acting upon the selenium cell 43 will vary inversely as the density of the sound record striations, the light acting strongly upon the selenium cell when a comparatively transparent striation is brought opposite the slit 42, and acting very weakly upon the selenium cell when a denser striation is brought opposite the slit. The resistance of the selenium cell, as is well known, varies with the intensity of the light acting thereon, so that the current in the telephone receiver circuit will be caused to fluctuate, these fluctuations being determined by the sound record, with the result that the original sound is reproduced.

Below the continuously rotating toothed roller 39 the films move intermittently and the picture film 10 is moved across an aperture 47, the pictures being projected upon a screen 48 by rays from a suitable source of light 49 which are preferably focused by the lenses 50 and 51. Suitable guide members 52 may be provided for coöperation with the rollers 39 and 40 to carry the films through the machine in the proper manner, and the mechanism for moving the films and projecting the pictures may be of the conventional construction.

After the films have been properly developed, and positives then produced from the negatives by contact printing or otherwise, the picture film 10 and sound film 11 are brought together and assembled for the reproducing apparatus. The corresponding identification characters 10^a and 11^a on the respective films indicate corresponding portions of the picture record and sound record, so that there is no difficulty in arranging the films for a synchronous reproduction of the pictures and sounds. The sound must be reproduced from the continuously moving film, while the pictures are reproduced from the intermittently moving film, so that the portion of the sound record corresponding to any particular picture must be several steps behind the picture as the film passes through the machine. Ordinarily, ten spaces would be about the proper amount so that in assembling the two films the numeral "7" on the sound film would overlap the numeral "17" on the picture film, etc. This relation, however, can be varied, as may be required to bring about a synchronous reproduction of the sounds and pictures. The picture film 10 and sound film 11 may either be kept separate and distinct from each other, or the overlapping edges thereof may be cemented together so as to produce in effect a single film.

The sound record is made simultaneously with the picture record, and this may be accomplished either by photographic means, as in the present instance, or by any other suitable means, although the two records are made upon separate films or strips so that they are susceptible of having the necessary individual treatment necessary to the best results. When the sound record is made photographically, the arrangement is such that the sound controlled lamp is caused to give a more intense light for the louder sounds than for the weaker sounds, with the result that the loud sounds produce dark striations upon the master film and the weaker sounds lighter striations. The sound record employed for reproducing purposes is made by contact printing from the master sound record film, and it will accordingly be obvious that in the reproducing sound record the loud sounds are represented by light or partially transparent striations while the weak sounds are indicated by dark striations. The light thus acts strongly upon the selenium cell for a strong sound and more weakly for a weak sound. This sound record, made upon a separate strip by photographic or other suitable means, bears identification characters corresponding to other similar identification characters produced upon the picture record, so that after the two records have been completed by the special individual handling or treatment necessary to the best results for each record, they can be readily assembled in the proper relation to produce a synchronous reproduction of the pictures and sounds.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A talking picture apparatus including means for simultaneously making separate and independent sound and picture records, a marking element having separate oppositely located series of corresponding identification marks, and means for simultaneously printing said corresponding identification marks upon the two records to facilitate assembly for a synchronous reproduction.

2. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, means for making a picture record upon one of the films and a sound record upon the other film, and a printing member movable with the films and means for coöperating with said printing member for placing a series of corresponding identification marks upon the films to facilitate assembly for a synchronous reproduction.

3. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, means for making a picture record upon one of the films and a sound record upon the other film, and a printing strip movable with the films and overlapping the edges

thereof, said printing strip having identification characters thereon, and means cooperating with said strip to place a series of corresponding identification marks upon the films to facilitate assembly for a synchronous reproduction.

4. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, means for simultaneously making a picture record upon one of the films and a sound record upon the other film, an opaque printing strip overlapping the two films and provided at the overlapping portions thereof with transparent identification characters, apertures under which the transparent identification characters are movable, and means for projecting light through the apertures to print the identification characters upon the films.

5. Talking picture apparatus including a casing, means including toothed rollers for simultaneously moving two independent films through the casing, means for simultaneously making a picture record upon one of the films and a sound record upon the other film, an opaque printing strip perforated for engagement with the before-mentioned toothed rollers and movable through the casing with the films, the edges of the opaque printing strip overlapping the edges of the films and being provided with corresponding transparent identification marks, independent apertures under which the transparent marks upon the edges of the opaque printing strip are movable, and means for projecting light through the apertures to print the identification marks upon the edges of the films.

6. Talking picture apparatus including a casing, mechanism for moving two independent films through the casing, a portion of the movement being continuous while another portion thereof is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for simultaneously making a sound record upon the continuously moving portion of the other film, and means for simultaneously placing corresponding identification marks upon the continuously moving portion of one film and the intermittently moving portion of the other film so that corresponding portions of the picture and sound records can be readily identified.

7. Talking picture apparatus including a casing, mechanism for moving two independent films through the casing, a portion of the movement being continuous while another portion thereof is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for simultaneously making a sound record upon the continuously moving portion of the other film, and a printing strip movable through the casing with the films and overlapping the same, said printing strip having identification means thereon, and means cooperating with said strip for placing corresponding identification characters upon the two films so that corresponding portions of the sound record and picture record can be readily identified.

8. Talking picture apparatus including a casing, mechanism for moving two independent films through the casing, a portion of the movement being continuous while another portion of the movement is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for making a picture record upon the continuously moving portion of the other film, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with corresponding series of transparent identification characters, and means for projecting light upon the transparent identification characters for causing the same to be printed upon the films as the films and strip are moved through the casing.

9. Talking picture apparatus including a casing, mechanism for simultaneously moving two films through the casing, a portion of the movement being continuous while another portion thereof is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for simultaneously making a sound record upon the continuously moving portion of the other film, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with independent series of transparent identification characters, and the corresponding characters of the two series being at such an interval that one of them will be over the continuously moving film upon which the sound record is made while the other one is over the intermittently moving film upon which the picture record is made, and means for projecting light upon the corresponding transparent characters of the opaque strip for causing them to be simultaneously printed upon the two films.

10. Talking picture apparatus including a casing, means for simultaneously moving two independent sensitized films through the casing, a portion of the movement being intermittent while another portion of the movement is continuous, means for making a picture record upon the intermittently moving portion of one of the films, a slitted aperture being arranged opposite the continuously moving portion of the other film, a sound controlled light, means for focusing

the rays from the light through the slitted aperture, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with two series of corresponding transparent identification characters, and means for projecting light upon the printing strip for causing the transparent characters to be printed upon the two films.

11. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, a portion of the movement being intermittent while another portion of the movement is continuous, means for making a picture record upon the intermittently moving portion of one of the films, a slitted aperture being arranged opposite the continuously moving portion of the other film, a lens for focusing light through the aperture, an electric lamp for the lens, a circuit for the light, a microphone, a circuit for the microphone, the two circuits having an electro-magnetic coupling so that the intensity of the light is controlled by the sound, and means for placing a series of corresponding identification marks upon the two films to facilitate assembly of the picture and sound records for a synchronous reproduction.

12. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, a portion of the movement being intermittent while another portion thereof is continuous, means for making a picture record upon the intermittently moving portion of one of the films, an aperture being arranged opposite the continuously moving portion of the other film, a lens for focusing light through the aperture upon the film, an electric lamp for the lens, a circuit for the lamp, a microphone, a microphone circuit, the lamp circuit and microphone circuit having an electro-magnetic coupling so that the intensity of light obtained from the lamp is controlled by the microphone, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with two series of corresponding transparent identification characters, and means for projecting light upon the printing strip for causing the transparent identification characters to be printed upon the two films.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY C. BULLIS.

Witnesses:

EMORY L. GROFF,

ELSIE C. SMALL.

Jan. 3 1928 1,655,926

T. J. ENGEL

TALKING MOTION PICTURE

Filed Apr. 2 1923

Fig 3.

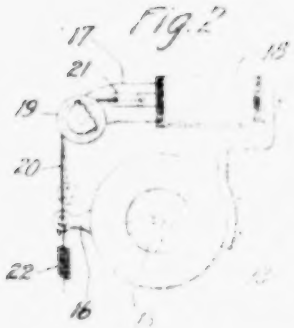


Fig. 2

Inventor:
Theodore J. Engel
by Jas. A. Palmer Atty

Patented Jan. 3, 1928. 1,654,926

UNITED STATES PATENT OFFICE.

THEODORE J. ENGEL, OF WOODSIDE, NEW YORK, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TALKING MOTION PICTURE.

Application filed October 2, 1923. Serial No. 666,157.

This invention relates to talking motion pictures and has for its object to coordinate the reproduction of sound and pictures from separate records.

This object is attained by photographically recording sound and pictures on separate films and under exposing corresponding portions of the films to produce blank spaces on the final records by means of which they may be matched for coordinated reproduction.

Referring now to the drawings, Fig. 1 discloses diagrammatically a photographic sound recorder and a photographic picture recorder equipped with shutters for interrupting the exposure; Fig. 2 is a detail view of the shutter and Fig. 3 shows speech and sound film records produced in accordance with the invention.

In Fig. 1, 10 represents a motion picture camera or similar photographic device for recording pictures on a continuous strip of film 10^a and 11 designates a photographic sound recorder wherein the intensity of a beam of light from a source 11^a is varied in response to sound waves to produce a record on a continuous strip of photographic film 11^b. The means for varying the light is not disclosed as it forms no part of this invention. Arranged adjacent the lens of the camera 10 in position to control the light admitted to the camera is a shutter 13. A similar shutter 14 is provided in the sound recorder and is arranged to control the beam of light to which the sound record film is exposed.

The shutters 13 and 14 which are disclosed diagrammatically in Fig. 1 are identical and the structure thereof is shown in detail in Fig. 2. These shutters are the same as the ordinary camera shutters except that the leaves 15 have been reversed so that the shutter remains normally open instead of closed. The leaves are operated by means of a lever 16 the same as in a camera shutter, a movement of the lever in one direction being effective to cause a closure and immediate opening of the shutter, the return movement of the lever having no effect.

To effect operation of the shutter, there is supported therefrom a frame 17 on which is mounted an electromagnet 18. Also supported by the frame 17 is a pulley 19 over which is trained a wire 20, one end of which is connected to the lever 16 and the other end of which is connected to the armature 21 of the magnet 18. A spring 22 exerts tension on the lever 16 to normally retain it in the full line position to permit operation thereof to the dotted line position under the influence of the pull exerted upon energization of the electromagnet 18. A battery 23 is provided to supply electrical energy for energizing the magnets and a switch 24 is arranged in circuit with the magnets and the battery for controlling the supply of energy to the magnets.

In the recording of pictures and sound with this apparatus, the switch 24 is closed at the starting of the recording, thus simultaneously closing the shutters 13 and 14 thereby momentarily preventing exposure of the sound and picture recording films. The recording of the pictures and sound is then continued in the ordinary manner, the switch 24 being closed at intervals at the discretion of the operator thereby simultaneously closing the shutters 13 and 14 and preventing momentarily, the exposure of the films. When the films are developed there will be corresponding blank spaces 25 and 26, Fig. 3 at the beginning of each film and at intervals throughout them corresponding to the under exposures. These blank spaces are so small that they do not materially affect the reproduction of the pictures or the sound but yet are of sufficient size that the films may be coordinated by matching the corresponding blank spaces.

It is, of course, understood that various modifications may be made in the structure of this apparatus without in any way departing from the spirit of the invention as set forth in the appended claims.

The invention claimed is:

1. In combination, a motion picture camera, a sound recorder comprising a light sensitive means, a normally opened shutter for

said camera and a normally opened shutter for said sound recorder, and means for simultaneously closing said shutters.

2. In combination, a motion picture camera, a sound recorder comprising a light sensitive means, a normally opened shutter for said camera and a normally opened shutter for said sound recorder, electromagnetic means for closing said shutters, and means for controlling the operation of said electromagnetic means.

In witness whereof, I hereunto subscribe my name this 27th day of September, A. D., 1923.

THEODORE J. ENGEL.

Aug. 7, 1928. 1,679,708

H. C. BULLIS

MOTION PICTURE STRIP

Filed Dec. 1, 1926

Fig. 1.

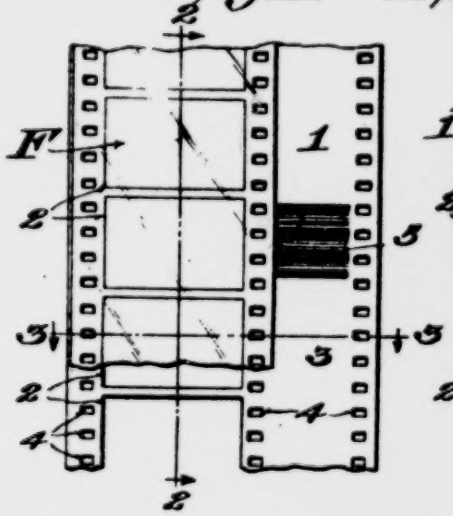


Fig. 2.

Fig. 4.

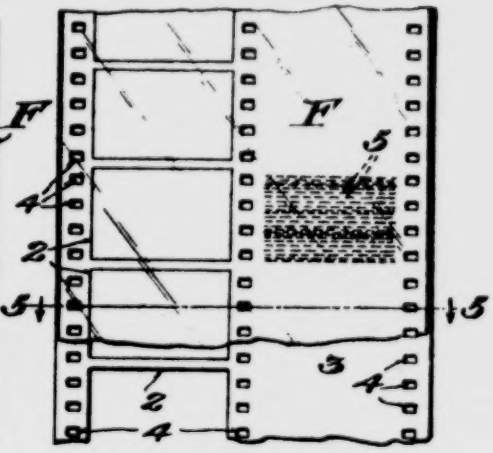


Fig. 3.

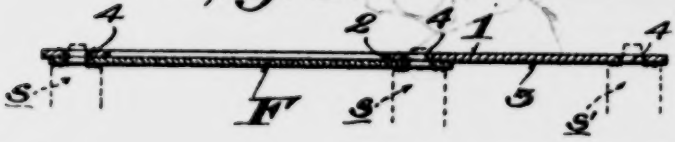
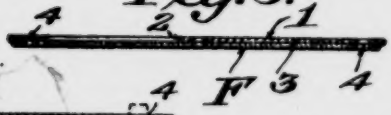


Fig. 5.



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Patented Aug. 7, 1928. 1,679,708

UNITED STATES PATENT OFFICE.

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MOTION-PICTURE STRIP.

Application filed December 1, 1926. Serial No. 151,969.

This invention relates to an improvement in film strips used in connection with motion picture machines, and more particularly to a strip including a combined sound and picture record, thus being adapted to produce the so-called talking pictures.

While it has been heretofore proposed to combine a sound and picture record photographically on the same film, it has been difficult to successfully carry out this scheme, chiefly for the reason that different manipulation and treatment of each record is required, in the developing of the picture record and sound record, to obtain the best results, and this is not possible where both records are photographically made on the same film. I have found that where the recording of the sounds is accomplished photographically, the two-film method as set forth in my Patent No. 1,335,651 of March 30, 1920, is the most practical when a photo-electric cell is used to reproduce the sounds, while the separate film method shown in my Patent No. 1,213,150, January 23, 1917, is preferred when it is desired to provide a metallic record of magnetic permeability from a photographic negative. However, it is also practical and desirable to provide a picture strip including a combined picture and sound record, which latter may be reproduced by an electro-magnetic inductive device such as employed in the well-known telegraphophone method.

Therefore, the present invention has primarily in view the provision of a picture strip having combined therewith a metallic sound record medium, whereby the speech sounds accompanying each picture may be accurately recorded together in proper synchronism and syntonism on the same strip, while at the same time providing for reinforcing and strengthening the film strip so that the same is not liable to become broken or torn in use.

Owing to the more or less fragile nature of the usual picture film, they are liable to break or tear, either from ordinary handling or by ruptures received when passing through the exhibiting apparatus.

Therefore, the invention also has as a further object the remedying of this difficulty by providing a celluloid picture strip with a metallic reinforcement thus providing a durable and substantial combined sound and picture record which will not become easily ruptured or broken in use, and which, although embodying metallic reinforcement, may be handled with the same facility as the ordinary celluloid film but with a much greater degree of safety.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings in which:—

Figure 1 is a plan view of a combined picture strip and metallic sound record.

Figure 2 is a longitudinal sectional view thereof taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged cross-sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a plan view of a modified form of the invention.

Figure 5 is a detail cross-sectional view taken on the line 5—5 of Figure 4.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

A novel and distinctive feature of the present invention resides in providing a sensitized picture strip, preferably of the usual celluloid composition, with a suitable metallic reinforcement which not only provides a substantial body or backing for the said picture strip, but at the same time constitutes a metallic record base which is susceptible of recording a sound wave produced by an electro-magnetic device which inductively records the fluctuations of sounds, in accordance with the well known telegraphophone principle. That is to say, the present invention proposes to combine a picture and sound record, by reinforcing the celluloid picture strip with suitable metallic reinforcement which constitutes a metallic medium susceptible of recording a magnetic sound record, and strengthening the film.

A practical and commercially feasible way of carrying these novel features into effect is illustrated in Figures 1, 2 and 3 of the drawings, wherein it will be observed that I have provided a metallic base 1 preferably in the form of a very thin steel tape or ribbon which is preferably of greater width than the ordinary celluloid picture film strip. This metallic base is provided with an alined series of windows or picture

apertures 2 at one side thereof, which are of the same general dimensions as a picture that is recorded on the usual motion picture strip, and is also provided with a metallic sound record margin 3 at one side of the series of alined picture openings. This sound record margin may be of any suitable width, but is preferably of less width than the picture strip as shown in Figures 1, 2, and 3. However, in Figure 4, the sound record margin is shown to be of substantially the same width as the picture strip portion so that the film may be adapted to a margin involving three equally spaced sprockets or a single sprocket having three sets of sprocket teeth. The sound margin 3 is adapted to receive metallic sound striations such as disclosed in my former Patent No. 1,213,150 aforesaid, so that the present film may be used on the same type of machine that is used to reproduce the form of record shown in the patent.

Accordingly, to the embodiment of the invention shown in Figures 1, 2, and 3, the metallic ribbon 1 has secured to one face thereof, by cement or otherwise, a sensitized celluloid picture film F which may extend to a point beyond the middle of intermediate rows of sprocket openings 4, thus leaving the sound margin 3 exposed, or on the other hand, as shown in Figure 4, the celluloid film may extend substantially across the entire width of the ribbon 1 to secure the advantage of a greater attaching area, thus adding to the strength and stability of the strip. This combined metallic backing and film is provided with the triple series of traction openings 4 as shown for engaging the film advancing drums of the reproducing device in the well-known manner. Accordingly, when the sensitized film is attached to the metallic base or support, it will be clear that the same is provided with such reinforcement as will greatly strengthen the film while at the same time providing a metallic record at one side of the picture apertures which is susceptible of recording and reproducing a sound record produced or reproduced by a suitable electromagnetic device. As shown in Figure 3, wherever it is necessary for the sprocket means to engage with the side of the ribbon carrying the film, the sprocket S' may be made of larger diameter than the sprocket S, to compensate for the relatively stepped cross sectional formation of the ribbon.

As previously indicated, this construction provides a strip which may be readily used with the triple sprocket traction devices used on the machine for reproducing the sound record made in accordance with the method disclosed in my Patent No. 1,213,150. And, in this case, the sound recording device is preferably of such a nature that the sound waves are recorded in a series of transverse lines 5 across the width of the metallic sound record portion 3.

From the foregoing, it will be apparent that regardless of the particular structure utilized in carrying out the invention, the same general principle is involved in each instance. That is to say, in each type of structure shown in the drawings, a sensitized picture film strip is reinforced and supported by a suitable metallic element or elements which extend throughout the length of the film, and which metallic element or elements may be utilized to carry a sound record at one side of the picture recording record, and parallel therewith.

Without further description, it is thought that many features and advantages of the present invention will be readily apparent, and it will also be understood that various changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit of the invention or scope of the appended claims.

I claim:—

1. A combination sound and picture record strip including a metallic ribbon having a plurality of picture apertures and traction openings on each side thereof, and also having a relatively wide sound recording margin parallel to the picture apertures, said margin also being provided with traction openings at its outer edge, and a film carried by the said ribbon and being substantially co-extensive therewith.

2. A combination sound and picture record strip including a metallic ribbon having a plurality of picture apertures extending partially across the width thereof and bounded on each side by a line of traction openings, the said strip being also provided with a third row of traction openings lying adjacent one edge and the area of the ribbon between the last mentioned traction openings and the traction openings at the inside edge of the picture apertures constituting a relatively wide sound recording zone, and a picture film carried by the metallic ribbon and covering the picture apertures.

3. A combination sound and picture record strip including a metallic ribbon having a plurality of picture apertures and traction openings on each side thereof and at the intermediate portion, said ribbon also having a relatively wide margin parallel to the picture apertures and adapted to receive a magnetic sound record, and a picture film carried by said metallic ribbon and overlying the picture openings therein.

In testimony whereof I hereunto affix my signature.

HENRY CHARLES BULLIS.

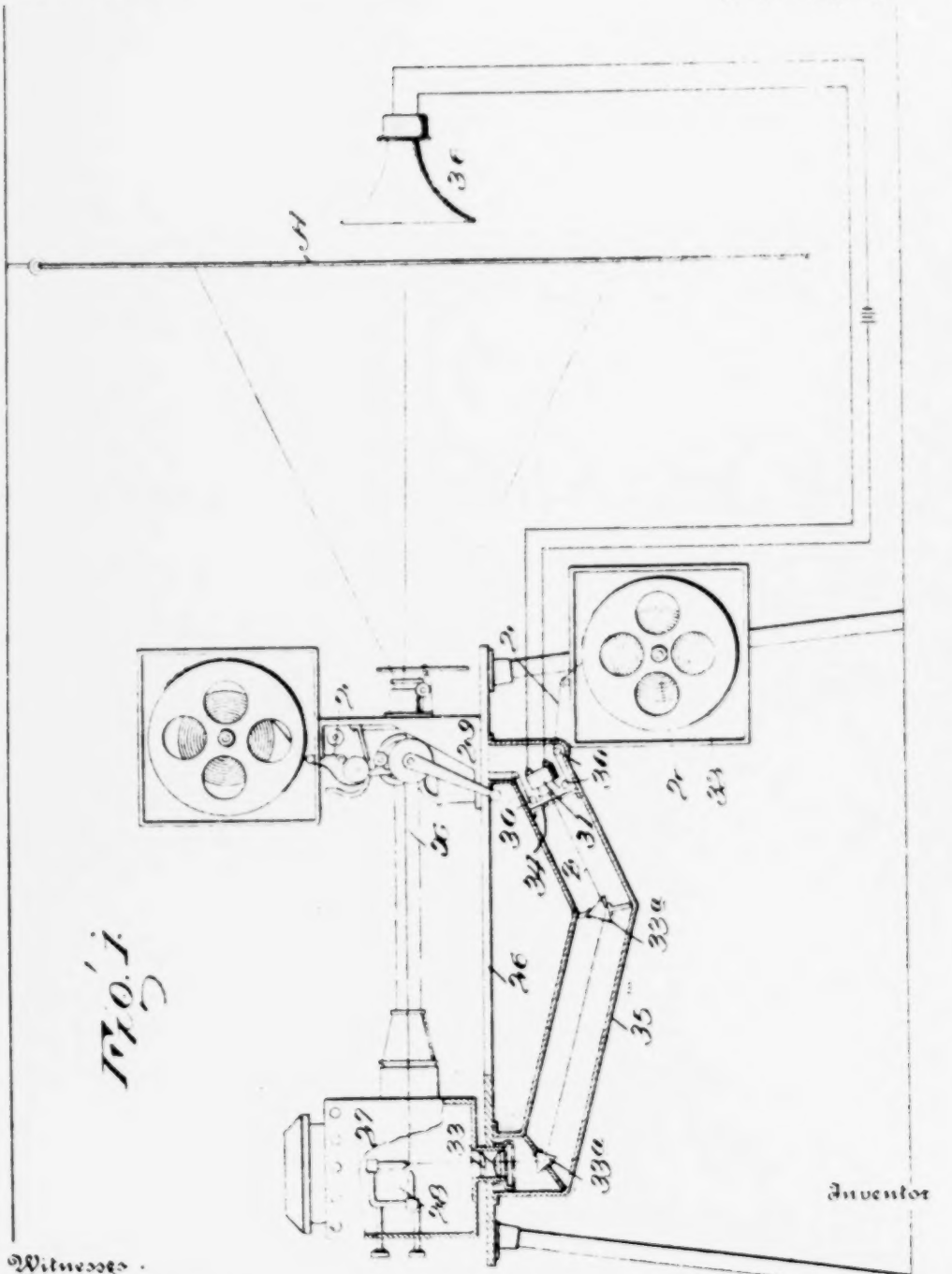
R. M. CRAIG.

MOVING PICTURE MACHINE

APPLICATION FILED AUG. 12, 1914.

1,260,338.

Patented Mar. 26, 1918.



Witnesses.

Inventor

R. M. Craig

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R. M. CRAIG.

MOVING PICTURE MACHINE.

APPLICATION FILED AUG. 12, 1914.

1,260,338.

Patented Mar. 26, 1918.

2 SHEETS—SHEET 2.

FIG. 2.

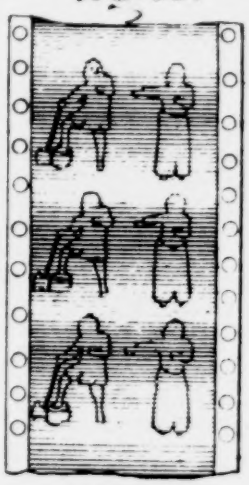

FIG. 7.

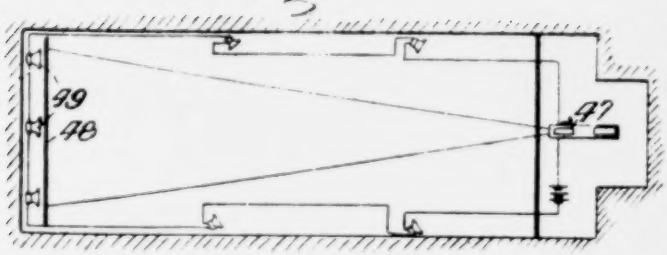

FIG. 3.

FIG. 5.

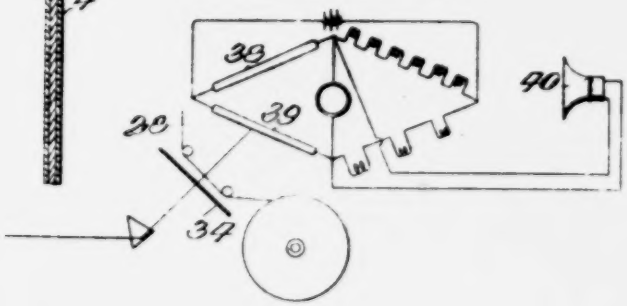

FIG. 8.

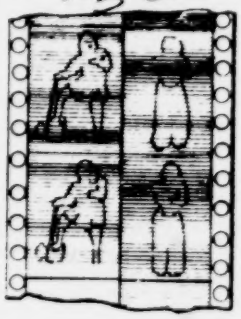

FIG. 4.

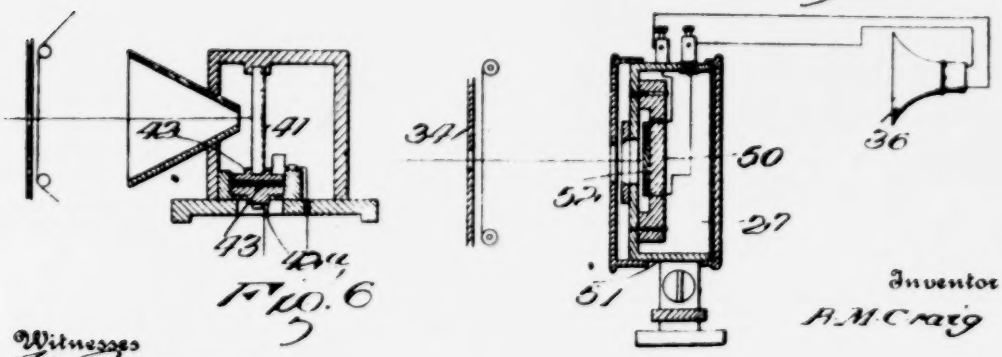

FIG. 6.

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UNITED STATES PATENT OFFICE.

RICHARD M. CRAIG, OF SAN ANTONIO, TEXAS.

MOVING-PICTURE MACHINE.

1,260,338. Specification of Letters Patent. Patented Mar. 26, 1918.

Original application filed May 8, 1913, Serial No. 765,959. Divided and this application filed August 12, 1914. Serial No. 856,420.

To all whom it may concern:

Be it known that I, RICHARD M. CRAIG, citizen of the United States, residing at San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Moving-Picture Machines, of which the following is a specification.

My invention relates to phonographic or "talking" moving pictures, and more particularly to the art of taking and projecting such moving pictures with the accompaniment of sound recording and sound reproduction respectively.

Many attempts have been made to secure with the reproduction of moving pictures, the reproduction of sounds correlated therewith. Almost all these attempts have been made by operating the moving picture film in conjunction with the ordinary phonograph or gramophone. The difficulty of using an instrument of this character to reproduce sounds correlated with the film is that the phonograph must of necessity be practically a separate machine from either the camera whereby the pictures are taken, or the projector whereby they are thrown upon the screen, and that with either the gramophone or the phonograph it is practically impossible to secure a sound record which shall be conterminus with the moving picture film. The maximum sound record as used today will not run for longer than five minutes, whereas the moving picture scene may be very much longer. Further than this, it is practically impossible to run the phonograph or gramophone in synchronism with the film and this is a very vital necessity for the proper correlation of the sound record with the pictures. Again, if the film runs off or breaks, the phonograph must be stopped, and it is almost impossible to again adjust the film in proper correspondence and correlation with the sound record. The mere connecting up of the sound reproducing mechanism with the mechanism of the moving picture machine will not secure a complete correspondence and correlation between the sound and the pictures, for the reason that the film is liable to slip and to tighten or loosen upon the reels, and it would be extremely hard to adjust the film so as to correspond accurately with the motion of the picture. An accurate correspondence of the sound with the event with which the sound is correlated, is, of course, absolutely necessary to prevent a disjunction which would entirely spoil the effect.

Furthermore, the phonographic record can naturally contain only so many words and this requires the film to be made of a certain length only, this length corresponding with the phonographic record, instead of which the sound record should be made for and with the picture record of any possible scene or happening that might occur, and the sound record should have the same length as the scene record and not be limited as to length.

Again, the process of making phonographic records requires extra care and especially prepared staging. The phonograph requires an extra attendant to place the records thereon. Furthermore, the picture record and the sound record have heretofore been taken separately and could not therefore be in accurate correspondence, nor could they ever be placed in accurate correspondence under these circumstances. It is a very difficult problem and requires elaborate arrangement of costly mechanism to keep a film synchronized with a phonographic record. If the film happens to run off while exhibiting the phonographic record and the pictures on the film get out of time, it is practically impossible to get them in time again. If the film should happen to get torn in two or broken, which sometimes happens, and the film is cemented together, the words corresponding to the part torn out of the film can never be taken from the phonograph record, and this destroys the further use of the two together.

The primary object of my invention is the provision of mechanism whereby a sound record film of the form shown and claimed in my pending application for patent, Serial No. 765,959, filed May 8, 1913 (of which case the present application is a division) may be reproduced synchronously with the reproduction of moving pictures.

A further object is to so form sound reproducing mechanism that it will reproduce the films illustrated and described in my above named application with only a slight change being necessary in the mechanism now used for producing moving pictures.

A further object is to provide reproducing means so constructed that a film may be

used as both the picture record carrier and the sound record carrier and in which the pictures and the corresponding sound records are so arranged on the film that they shall be at all times in fixed relation to each other and reproduced simultaneously and without chance of the sound record having its relation to the picture record changed.

A further object is to so form the reproducing apparatus that sound records may be translated into electrical vibrations and these in turn carried to various parts of a hall within which the machine is to be used.

A further object is to so construct the machine for reproducing the picture and accompanying sounds, that the manner of operation shall be extremely simple, both as regards the reproduction of the sound records and the reproduction of the moving pictures.

Still another object is to so construct the mechanism for reproducing the sound record in conjunction with the projection of the moving pictures that while the film shall move at one point intermittently to reproduce the pictures, the film shall move steadily at one point to reproduce the sound record and in this connection to provide mechanism for causing the projection of a certain class of light rays through that portion of the film which is moving intermittently, causing the display of moving pictures, and causing the projection of another class of light rays through that portion of the film which is moved steadily whereby to reproduce the sound record, and further, in this connection, to provide in combination with means for projecting one class of rays through said film, sound reproducing mechanism of such character as to be operated by the action of these rays.

Still another object of my invention is the provision of a machine adapted to project moving pictures and sound records simultaneously including means for projecting rays of invisible light through a portion of a film and projecting rays of visible light through another portion of the same film, the rays of the visible light producing the ordinary moving pictures on a screen while the rays of the invisible light act upon sound reproducing mechanism.

My invention is illustrated in the accompanying drawings wherein:—

Figure 1 is a view partly in section of my improved apparatus for projecting moving pictures and reproducing sound.

Fig. 2 is a face view of a portion of a combined moving picture and sound record film.

Fig. 3 is a transverse section of such a film.

Fig. 4 is a diagrammatic view partly in section of a "Bi-Ag" thermopile.

Fig. 5 is a diagrammatic view of a bolometer which may be used for the purpose of translating invisible light variations into sound vibrations.

Fig. 6 is a diagrammatic view of the Edison tasimeter which may be used for the like purpose.

Fig. 7 is a plan view of a moving picture theater, showing the arrangement of the telephone receivers therein.

Fig. 8 is a view similar to Fig. 2, illustrating another form of film.

My invention is based upon the fact that infra-red rays are invisible but that these rays will affect a properly sensitized photographic film, and that these infra-red rays will affect various forms of electrical phonographic receivers or sound transmitting devices. Infra-red rays may be passed through an ordinary photographic film or the film of a moving picture without being visible and without interfering with the proper projection of the picture by moving picture projecting apparatus. If a picture strip is prepared, therefore, having on one side the ordinary photographic reproductions of pictures, and on the other side a phonographic sound record capable of being reproduced only by the infra-red rays, the sound record will not interfere with the passage of white light to and through the pictures and the presence of the pictures will not interfere with the passage of infra-red rays through the strip. On one side of the film, or the strip, therefore, would be the ordinary picture record and on the other side would be a printed photographic record of sound, which record would be transparent to ordinary visible light but which record would more or less intercept the infra-rad rays to produce variations in the projection of these rays, these variations being used to affect sound transmitting apparatus as will be later stated. Infra-red rays are below the ordinary visible spectrum. They are invisible to the naked eye and are very penetrating and are subject to the same optical laws as ordinary light.

In my pending application Serial No. 765,959, filed May 8, 1913, I have fully described a film which may be used for this purpose and which carries upon it on one side a sound record through which visible rays may pass without obstruction and upon the other side a picture record through which the invisible rays may pass without obstruction.

In Fig. 3 I show a portion of a film or strip of moving pictures in which 2 designates the body of the film, 3 a coating upon which the photographic print is taken and 4 a coating of substance which is not capable of being acted upon photographically by ordinary light and which will act as a medium to carry a substance which will in turn act to intercept either partially or entirely said

infra-red rays. In said application I have also fully described and illustrated means whereby the combined picture record and sound record are taken.

My present invention relates entirely to the means for reproducing the combination sound record and picture film.

Generally speaking, for the reproduction of the picture record and the sound record, ordinary white light is passed through the picture record while the infra-red rays (invisible to the eye) are passed through the sound record and fall upon suitable instruments to be hereafter described whereby these infra-red rays will cause the reproduction of sound vibrations. There are a number of instruments that are sensitive to infra-red rays. The tasimeter invented by Thomas A. Edison will measure heat accurately down to the ten-thousandth part of one degree, but this instrument is probably too sluggish for the purpose of reproducing sound record. The selenium cell when sensitized by Abney's process is sensitive to infra red rays and may be used for the purpose. I believe, however, that the bolometer is best adapted for the purpose for several reasons, but principally because the element upon which the light falls can be made more nearly to coincide with the small horizontal lines of the photographic sound record. The width of the horizontal lines of the sound record would be regulated according to the speed of the film.

In the reproducing apparatus such as is hereafter described, infra-red rays are projected against the film containing the sound record and the picture record by suitable prisms such as prisms of rock salt, fluorite or Jena glass and focused through a narrow slit onto the film and after passing through the film fall on the reproducing instrument such as the bolometer. Connected in series with the bolometer or through similar apparatus would be loud-speaking phones such as the auristophone, the Edison or the Durceret loud-speaking phones.

Moving pictures are reproduced by intermittently moving the film. It is therefore plain that it would be impossible to use this film during its intermittent motion or at the point through which the white light rays are projected for the purpose of reproducing the sound record, it being plain that the sound record must be reproduced as it was taken, namely, by a continuous and uninterrmittent movement of the film. I overcome this difficulty therefore, by passing the infra-red rays through the film at a point on one side or the other of the point where the picture projecting rays are passing through, that is, at a point where the film is moving continuously and steadily.

An apparatus whereby the moving pictures may be projected and the sound record synchronously reproduced, is illustrated in Fig. 1. This figure shows an ordinary moving picture projecting apparatus comprising a table or base 26 supported in any suitable manner and supporting upon it the lamp housing 27 wherein there is disposed the ordinary right angle arc lamp 28 such as used in moving picture machines. Such a right angle arc is particularly adapted as a source of infra-red rays, while supplying at the same time the ordinary white light for the pictures. The light is projected from the lamp housing in any usual or suitable manner onto the film 2. This film is unrolled from an upper film reel and passes down through the usual moving picture projector 29. This mechanism contains means for intermittently shifting the film while the shutter of the mechanism is closed. Inasmuch as there are various types of this mechanism and it is thoroughly well known, it is not deemed advisable to describe the mechanism in detail.

The white light after passing through the film 2 is projected onto a screen A in the usual manner. The film after it passes below the aperture plate of the moving picture machine no longer moves intermittently but is shifted continuously and I have illustrated the film 2 as being passed around a series of rollers 30 and in front of the aperture of a selenium cell or like apparatus, this cell being designated 31. After passing in front of the aperture of the selenium cell the film 2 passes around a lower or receiving reel 32 which may be connected up with any suitable mechanism whereby the reel may be rotated continuously in a direction to wind up the reel 2 at a suitable rate of speed.

Disposed immediately below and in line with the meeting point between the carbons of the angular arc lamp 28 there are series of lenses 33. These lenses are preferably made of rock salt or fluorite or dense cobalt glass. The infra-red rays passing through these lenses 33 are transmitted by means of prisms 33ª of Jena glass or other suitable material to the aperture of the selenium cell 31. A diaphragm 34 is so disposed as to cause these rays to fall in the form of an elongated narrow or transversely extending beam upon the face of the selenium cell 31. Preferably the lenses 33 and the prisms 33ª are contained within a casing or housing 35.

The selenium cell 31 is formed in any usual or suitable manner and requires no particular description as it is the ordinary form of cell except that preferably the cell is treated by Abney's process so as to make it extremely sensitive to the infra-red rays. Mounted behind the screen or in any suitable portion of the exhibition hall is a loud-speaking phone designated 36 in Fig. 1.

This is a loud-speaking electric telephone and is connected in circuit with the selenium cell 31.

The operation of the picture and sound reproducing apparatus illustrated in Fig. 1 is of course obvious. The pictures are reproduced in the usual manner, but after the strip or film has passed beyond the specific moving picture mechanism, the strip passes in front of the selenium cell and the transverse bands or lines of the sound record on the film will act to more or less intercept, absorb, reflect or otherwise stop or impede the passage of the infra-red rays. Where the infra-red rays fall with full force upon the selenium cell, the cell will have a certain degree of electrical resistance. Where the infra-red rays are intercepted or their intensity changed in any manner, the electrical resistance of the selenium cell will vary correspondingly. There will therefore be a continual variation of the electrical resistance of the cell as the record film passes in front of the cell, and this continual variation of resistance will, in a manner well known, affect the mechanism of the telephonic translator 36 and thereby cause vibrations of the air corresponding to the sound vibrations and the sound will be reproduced. All of the mechanism heretofore described is well known by itself. The photophone operates on the same principle as the sound reproducing mechanism heretofore described, but using ordinary white light.

Inasmuch as sound reproductions may be secured by a large variety of electrical apparatus, affected by variations of rays falling upon it, I do not wish to be limited to the use of a selenium cell or any other specific apparatus for the purpose of translating the photographic sound records into air vibrations as any other mechanism having the same general function may be substituted for the selenium cell.

For purposes of illustration, I have shown in Figs. 5 and 6 two other forms of mechanism adapted to translate the vibrations of light rays into sound. Fig. 5 illustrates the bolometer as used for this purpose. The bolometer will measure heat accurately down to the ten-millionth of a degree. In Fig. 5, 38 and 39 indicate two thin platinum strips forming the two arms of a Wheatstone bridge normally in perfect balance. The infra-red rays passing through the film 2 in the form of a thin beam fall on one of these arms or strips, namely the strip 39. This disturbs the balance of the bridge. This Wheatstone bridge is connected as illustrated in the diagram to a telephonic translator 40 which is the translating device of any one of the loud-speaking phones previously referred to. The current passing through this translator will vary in correspondence with the variations of the red rays falling upon the strip 39 and therefore the photographic sound record will be reproduced as air vibrations. The action of this instrument is virtually instantaneous in its operation and extremely sensitive.

Fig. 6 is a diagram of the Edison tasimeter which may also be used for the purpose of translating photographic records into sound vibrations. In this figure, 41 illustrates a rod of vulcanite supported against a fixed abutment at one end and at the other end abutting against a movable disk 42. This disk bears in turn against a carbon button 43 disposed between the movable disk 42 and a fixed disk of metal 42^a. The two metal disks 42 and 42^a are connected in circuit to a loud-speaking phone 45 the current passing more or less between the disks 42 and 42^a through the carbon button as it is compressed. The variations in these red rays cause this vulcanite to contract and expand thus compressing the carbon button 43 between the metal pieces 42 and 42^a, causing variations in the current corresponding to the variations in the strength of the rays. This is extremely sensitive and forms one means of translating the photographic record into sound vibrations.

While I have illustrated three forms of electrical sound reproducing apparatus, I wish it understood that I may use other forms. Thus I might use a thermopile, especially a "Bi-Ag," a selenium cell made sensitive to infra-red rays by Abney's process, or any other delicate heat measuring instrument of like character.

While in Fig. 1 and Figs. 4 and 5 I have shown only one telephonic translator, this translator being shown in Fig. 1 as being disposed behind the screen A, it will be understood that with the electrical sound reproducing apparatus 1 may use a plurality of such translators disposed at various portions of an amusement hall, not only behind the screen but at the sides of the hall. This is obviously of great advantage and is not possible where ordinary sound reproducing mechanism is used.

Such an arrangement of phones is illustrated in Fig. 7 wherein the picture and sound projecting apparatus is designated 47 and illustrated diagrammatically, the picture being received upon the screen 48. As illustrated, there are three loud-speaking telephonic translators 49 disposed behind the screen 48 and a plurality of loud-speaking translators disposed along the side of the hall and facing toward the audience. Thus the sounds reproduced may be distinctly heard by everybody in the audience. While I have illustrated in Fig. 7 all of the phones as being connected in one circuit and as being actuated by one selenium cell, bolometer

or tasimeter, it is to be understood that when a film like that shown in Fig. 8 is used with two records placed in parallel position upon the film, a plurality of sets of sound reproducing apparatus is to be used. Thus, in this last case, there will be two beams of infra-red rays projected through the film, each falling upon a separate bolometer, tasimeter or like apparatus, and each such reproducing mechanism being electrically connected to one of a series of sets of phonographic transmitters. By using the film above referred to, a dialogue may be reproduced so that the sounds will issue from translators set at opposite sides of the hall or at opposite points behind the screen, thus causing the dialogue to seem more natural than if it apparently issues from one point only. It is obvious that a larger number of records could be placed upon the same film and thus the sounds be caused to issue from a plurality of points behind the screen or around the hall.

The two main features of my invention upon which the invention is based are in the first place the provision of a film capable of receiving not only the photographic prints of the pictures to be projected, but also the photographic record of the sound and the use with these films of invisible rays for the purpose of reproducing the sound record. The other important and vital feature of my invention resides in the provision of means whereby the sound record may be taken from that portion of the film which is moving continuously while that part of the film through which the rays of white light are projected is moved intermittently.

In printing the sound record upon the strip or film 2, the sound record is started a sufficient distance beyond the starting point of the picture record so that at the instant that any one event is being projected on the line x, the sound record corresponding to this event is passing the axis of line Z. Inasmuch as in taking or making the picture record and the sound record two separate negative films or strips are used, it is entirely possible in printing these records upon the film 2^a to displace the sound record with relation to the picture record in the manner stated. While I have shown the axis Z of the infra-red beam as being about twelve inches below the axis x of the white light beam, I wish it understood that the two axes may be much nearer than this and that the drawing in Fig. 1 is purely illustrative in this regard, and further that I may pass the infra-red rays through the strip 2 above the picture projecting mechanism and above the axis x.

While I have referred to the lenses and prisms for focusing and transmitting the invisible rays as being made of rock salt, or Jena glass, it is of course obvious that they may be made of other material such as fluorite, or dense cobalt glass, or that I may use metallic reflectors for deflecting the invisible rays along the line Z.

By using a film having thereon a plurality of sound records, great naturalness could be secured as before stated by the fact that the transmitters translating the variations in the sound record into sound vibrations, could be located nearer to or farther from the inner side of the screen, or could be located on opposite lateral sides of the screen or stage so that the voice will apparently be projected in accordance to the position of the actors in the moving picture. It is obvious also that in place of using a camera having a megaphone for transmitting sounds to the "speaking arc" or the manometric flame, sensitive microphone transmitters might be used at various portions of a stage upon which actors were acting a moving picture play, and that the vibrations of these microphones could be transmitted electrically to diaphragms placed within a camera to thereby transmit the sounds proceeding from the several microphones to the several flames or speaking arcs to be recorded in separate columns upon the sound record film.

In Fig. 4 I show diagrammatically a "Bi-Ag" thermopile as above referred to. As this themopile is well-known an extended description is not necessary. The thermopile consists of a frame 50 having an opening at its middle and extending across this opening are a plurality of copules 52 composed of connected bismuth and silver wires. These couples are joined by overlapping plates of tin, the junctions formed by the plates being covered with platinum black. The frame 50 with its couples of platinum and silver is supported inside of a casing 51 having a narrow slit through which the infra-red rays are projected upon the junction plates. The couples of silver and bismuth are connected in circuit with a receiver of a loud-speaking telephone in the manner heretofore described. A thermopile of this character is fully described in Bulletin No. 4 issued by the Bureau of Standards on Instruments and Methods of Radiometry. Therefore no extended description of the thermopile is necessary.

In case the talking picture machine before described is desired to be used in very large theaters where it would take a sound a perceptible time to travel the distance and where it would be possible to see the picture, therefore, before hearing its corresponding sound, the following arrangement could be made. After the system has been brought to a standard the instrument sensitive to the infra-red rays would always be just a certain distance from the lens or just a certain number of pictures below the lens. In

a large theater, therefore, it would be only necessary to slightly advance the instrument, that is, move it a bit nearer to the lens, in which case the sound of a given event would slightly precede the picture but the sound would reach the observer at the same time that the picture was shown.

Having thus described the invention, what is claimed is:—

1. In apparatus for the reproduction of a sound and picture record in the nature of a film transparent to visible and invisible light, said film having thereon a photographic picture record adapted to permit the free passage of rays of invisible light but to intercept or affect the passage of rays of visible light and having thereon a sound record composed of a substance adapted to permit the free passage of rays of visible light but intercept or affect the rays of invisible light, comprising means for intermittently moving one portion of the film, means for steadily moving another portion of the film, means for projecting a beam of visible light through the intermittently moving portion of the film, means for projecting a beam of invisible light through the steadily moving portion of the film, and means in the path of said last named beam for translating the light variations of the beam into sound vibrations.

2. Means for reproducing moving pictures and corresponding sounds from a film transparent to visible and invisible light rays and having on one side thereof a series of consecutive photographic pictures adapted to permit the free passage of invisible rays but intercept or affect the passage of visible rays of light and on the other side a sound record adapted to permit the free passage of rays of visible light but intercept or affect the passage of invisible rays, including a source of visible light rays, means for intermittently moving the film across a beam of light proceeding from said source to thereby project moving pictures, a source of invisible rays, means for steadily moving the film across a beam proceeding from said source of invisible rays to thereby project the sound record, and means in the path of said last named rays after they pass through the film adapted to translate the variations of intensity in said beam of invisible rays into sound vibrations.

3. Means for reproducing moving pictures and corresponding sounds from a film having on one side thereof a series of consecutive pictures designed to affect the passage of visible rays but permitting the free passage of invisible rays and having on the other side thereof a sound record adapted to affect the passage of invisible rays but permit the free passage of visible rays, including a source of visible rays and a source of invisible rays, means for intermittently moving the film across a beam proceeding from the source of visible rays, means for steadily moving the film across the beam of rays proceeding from the source of invisible rays, a telephonic translator, and a receiver upon which the beam of invisible rays fall, said receiver being connected in circuit with the telephonic translator, the resistance or conductivity of the receiver being altered by being subject to invisible rays.

4. Means for reproducing moving pictures and corresponding sounds from a film including a source of light, means for projecting visible light rays from the said source of light, means for projecting invisible rays from the said source of light in a path separate from the path of the visible rays, the said film having thereon a series of consecutive photographic pictures adapted to intercept or affect the passage of visible rays and having a sound record adapted to permit the free passage of visible rays but to intercept or affect the passage of invisible rays, means for intermittently shifting the film across the path of the visible rays to thereby project the moving pictures, and means for steadily moving the film across the path of the invisible rays to thereby project the sound record, means for translating the variations in the invisible rays into sound comprising a receiver electrically sensitive to the action of invisible rays, and a translator electrically connected to said receiver.

5. Reproducing apparatus for use in connection with a transparent film having thereon a plurality of sound records formed of a substance intercepting or affecting the passage of invisible rays, including means for steadily moving said film, of a receiver adapted to have its electrical conductivity or resistance varied by the action of invisible rays, means for projecting invisible rays through said film upon said receiver, and a plurality of telephonic translators connected in circuit with said receiver.

6. In an apparatus of the class described, means for projecting visible and invisible light rays synchronously through a film record movable in the path of both of said rays, said film bearing picture and sound records, the picture record being capable of affecting the passage of the visible light rays through the film and the sound record being capable of affecting the passage of invisible light rays through the film, the said sound record permitting the unobstructed passage of the visible light rays through the film.

7. Means for reproducing sound in connection with moving pictures synchronously from a film having a consecutive series of picture records and a correlated sound record, the picture record being transparent to invisible rays but affecting visible rays, the sound record unaffecting the visible rays

but affecting the passage of invisible rays, the sound record correlated with any specific event on any one picture of the series being longitudinally spaced therefrom along the film, a source of white light, a source of light rays beyond the visible spectrum, means for passing said film in the paths of the visible and invisible rays, and means acted upon by the invisible rays passing through the film for translating the variations in intensity of said invisible rays into sound vibrations.

8. An apparatus for projecting moving pictures and simultaneously reproducing sound including a source of visible and invisible rays, means for projecting a beam of visible rays, means for projecting a beam of invisible rays, means for passing a combined picture and sound record film successively past the beam of visible and the beam of invisible rays, and means for translating the variations in intensity of the invisible rays into sound vibrations.

9. An apparatus for projecting moving pictures and simultaneously producing sound comprising a source of light, means coacting with the source of light for projecting the visible light rays therefrom, means for intermittently moving a combined picture and sound record film through the beam of visible rays, means for projecting the picture formed by said beam upon a screen, means for projecting a beam of invisible rays, electrical sound reproducing devices including an element sensitive to the action of invisible rays, and means for passing said film intermittently through the beam of invisible rays.

10. An apparatus for reproducing sound from a film having thereon a consecutive series of sound wave impressions, said impressions being adapted to obstruct or impede the passage of invisible light rays, including means for projecting a beam of invisible light rays through said film, means for moving the film steadily past said beam, and means for translating the variations in the intensity of said beam caused by the variations in said record into sound vibrations including an element sensitive to the action of rays of invisible light and re-acting according to the intensity of said rays.

11. Apparatus for reproducing moving pictures and related sounds from a moving film record having on one side thereof a picture record designed to affect the passage of visible light rays and having on the other side thereof a sound record designed to affect the passage of invisible light rays and permit the free passage of visible rays, including means for projecting visible light rays through the film, means for projecting invisible light rays through the film, and means for translating the invisible light rays into sound vibrations.

12. Apparatus for reproducing moving pictures and related sounds from a moving film record having photographic and photophonographic records designed respectively to affect the passage of visible and invisible light rays, including means for projecting visible light rays through one part of the film, means for projecting invisible light rays through another part of the film, and means for translating the invisible light rays into sound vibrations.

13. The method of translating composite sound and related picture records from a moving picture film having on one side thereof a picture record designed to affect the passage of visible light rays and on the other side thereof bearing a sound record designed to affect the passage of invisible light rays and permit the free passage of visible rays, which consists in intermittently moving the film at one portion thereof, steadily moving the film at another portion thereof, projecting light rays through the film at the intermittently moving portion thereof to display the pictures thereon, and projecting invisible light rays through the steadily moving portion of the film and translating the variations of the invisible rays into sound vibrations.

14. The method of translating composite sound and moving picture film records, which records are designed respectively to affect the passage of invisible and visible light rays through the film, which consists in intermittently moving the film at one portion thereof, steadily moving the film at another portion thereof, projecting visible light rays through the intermittently moving portion of the film, projecting invisible light rays through the steadily moving portion of the film, directing the last-mentioned rays upon an element adapted to have its conductivity or resistance vary to correspond to the variations of said light rays and translating said variations in conductivity or resistance into sound vibrations.

15. Apparatus for reproducing moving pictures and related sounds from a moving film having on one side thereof a picture record designed to affect the passage of visible light rays and on the other side thereof a sound record designed to affect the passage of invisible light rays and permit the free passage of visible light rays including means for suitably moving the film record to permit of translation of the picture and sound records therein, means for projecting visible light rays through the film, means for projecting invisible light rays through the film, and means for translating the invisible light rays into sound vibrations.

16. Apparatus for reproducing moving pictures and related sounds from a moving film having on one side thereof a picture record designed to affect the passage of visi-

ble light rays and on the other side thereof a sound record designed to affect the passage of invisible light rays and permit the free passage of visible light rays including means for intermittently moving a portion of the film and a take up means for the film arranged to move the displayed portion continuously, means for projecting visible light rays through the intermittently moving portion of the film, means for projecting invisible light rays through the displayed and continuously moving portion of the film, and means for translating the invisible light rays into sound vibrations.

17. Means for reproducing moving pictures and related sounds from a moving film having on one side thereof a picture record designed to affect the passage of visible light rays and on the other side thereof a sound record designed to affect the passage of invisible light rays and permit the free passage of visible light rays including a single source of light, means for separating the visible and invisible light rays emanating from the source of light and directing the same through spaced portions of the film, and means for translating the invisible rays into sound vibrations.

In testimony whereof I affix my signature in presence of two witnesses.

RICHARD M. CRAIG. [L. S.]

Witnesses:

JOSEPH SHORE,

J. W. SCHUCHARDS.

2212

Plaintiff's Exhibit No. 32.

Bescheinigung.

Die Herren Hans Vogt in Berlin-Schöneberg, Joseph Massolle in Berlin-Friedenau und Dr. Joseph Engl in Berlin-Grunewald haben im Deutschen Reiche ein Gesuch um ein Erfindungspatent für

"Photophonetischer Begleitfilm für stumme bildmäBige Handlungen"

2213

am 2. April 1919 beim Reichspatentamt hinterlegt.

Das angeheftete Stück ist eine richtige und genaue Wiedergabe der ursprünglichen Unterlage dieser Patentanmeldung.

Berlin, den 5 Oktober 1932.
Der Präsident des Reichspatentamts.

I. V.
Lübcke

2214 (Seal)

V. 14 634 IX/57 a 2.

Phonetischer Beleitfilm für stumme bildmässige Handlungen.

Im Gebiete der "stummen" Kinematographie warden bis jetzt die notwendigen Bilderläuterungen entweder akustisch durch vortragende Personen oder optisch durch Mitzprojizieren von Schriften, Zwischenbildern oder Ahmlichem

gegeben. In dem meisten Fällen wurden die stumme Bildvorführung auch durch das Spiel von Musikkapellen oder mechanischen Musikwerken belebt.

Die Nachteile dieser Erläueterungsund Belebungsmittel sind bekannt.

Im Gebiete der "tönenden" Kinematographie, bei Verfahren, die gleichzeitig mit der kinetographischen Registrierung auch eine photographischen Fixierung der Töne ermöglichen und neuartige elektroakustische Reproduktionsmittel anwenden, sind die oben angeführten Mängel beseitigt. Die Praxis zeigte aber, dass bei einer Reihe von kinetographischen Massnahmen die synchrone Mitaufnahme des Klangereignisses bei der Bildaufnahme teils nicht erwünscht, teils nicht möglich ist .Z.B. wäre es nicht vorteilhaft, eine in der Darstellung von Pantominen gut arbeitende, aber mit einem schechten Sprachorgan ausgerüustete Spielfigur zu phonographieren. Ferner kann häufig in offenen Scenen die Akustik eine so schlechte sein, dass man auf die unmittelbare Mitaufnahme der scenischen Geräusche ververzichten muss. Bei Scherzaufnahmen, z.B. sprechenden Tieren, Attrappen usw. ist eine Schnallaufnahme so wie so unmöglich. 2216 2217

Die vorliegende Erfindung bezieht sich auf einen phonetischen Begleitfilm, dessen Photogrammen nicht die originalen Lautereignisse der photographierten Scene zugrunde liegen, sondern die anderer, sinngemäss günstiger gewählten Lautquellen. Dadurch wird ermöglicht, Bildern, stummen Kinematogrammen, Theatervorführungen usw. eine beliebige lautmässige Erläuterung und misikalische Ausschmük kung zu geben.

2218 *Plaintiff's Exhibit No. 32.*

Die Herstellung dieses nur bedingt synchron sein müssenden Gegleitfilms kann, an einigen Ausführungsbeispielen gezeigt, etwa folgendermassen geschehen:

Bei kinetographischen Aufnahmen der originalen plastischen Scene ist mit dem Transportmechanismus des Serienbilderanfnahmeapparates die Filmaufwickeltrommel eines besonderen Akustographen swangsläufig gekuppelt. Die zur Erläuterung, Ansschmückung und Belebung der optischen Handlung dienenden Lautquellen, wie
2219 Vortragende, Musikinstrumente, Geräuschmaschinen und desgl., sind ausserhalb des Objektivbildwinkels akustisch günstig postiert und treten bei Beginn der Handlung unter steter sinngenmässer Bezugnahme auf dieselbe in Aktion.

Wenn bei der kinetographischen Originalaufname aus irgend welchen Gründen, (z.B. Sturm) die Aufnahme des Begleitfilms nicht möglich ist, so kann dieselbe auch bei der Reproduktion des fertigen Bildfilms, Bildfilms, unter Massnahmen die den oben skizzierten ähnlich sind, geschehen.
2220 Hier wäre der Transportmechanismus des Reproduktionsapparates mit dem des Akustographen zu verkuppeln.

Die Weiterbehandlung der Bildfilme nach erfolgter Belichtung ist in beiden Fällen bezüglich des Kopierprozesses, der Wiedergrabe usw. die übliche. Wenn der Begleitfilm bei der Aufnahme dieselbe Forthbewegungsschnelligkeit wie der Bildfilm hatte, so können für die Wiedergrabe die beiden Ereignisreihen aus Zweckmässigkeitsgründen auch auf ein Filmband kopiert werden.

Ausser auf den oben skizzierten Wegen lassen sich Bilderläuterungs und– Belebungsphono-

 2221

gramme z.B. Filmtitel, Briefe, Musiksolos und dergl. natürlich auch einzeln herstellen und nach Art der Bildfilme zu kopierbaren akustischen Reihen vereinigen.

Um bestimmte in Handlung und Ton zusammengehörige Filmstellen bei der Bearbeitung zu erkennen, ist es ferner notwendig, die beiden mit einander in Beziehung stehenden Filme in bestimmten Abständen mit Marken oder Zahlen zu versehen.

2222

Patentanspruch;

1) Photophonetischer, durch Querbelichtung hergestellter Begleitfilm für stumme Bilder oder Handlungen, dadurch gekennzeichnet, dass eine Aufnahme unabhängig von den, das originale optische Ereignis beleitenden Lauten bewarkstelligt wird.

2) Photophonetischer Begleitfilm nach Anspruch 1) dadurch gekennzeichnet, dass er bei der kinetographischen Originalaufnahme unter Benutzung nicht (oder num teils) scenenmässiger Lautquellen beeindruckt wird. 2223

3) Photophonetischer Begleitfilm nach Anspruch 1) dadurch gekennzeichnet, dass er unter Benutzung sinngemässer Lautquellen angesichts des reproduziert, werdenden Bildfilms hergestellt wird.

4) Photophonetischer Begleitfilm nach Anspruch 1) dadurch gekennzeichnet, dass er aus einzeinen, getrennt hergestellten und sinngemäss aneinandergereihten Photophonogram reihen besteht.

2224 *Plaintiff's Exhibit No. 32.*

5) Photophonetischer Begleitfilm nach Anspruch 1) dadurch gekennzeichnet, dass die Photogrämmreihen des Bild- und Begleitfilms auf ein Filmband kopiert sind.

6) Photophonetischer Begleitfilm nach Anspruch 1) dadurch gekennzeichnet, dass Bildund Begleitfilm abstandsweise Identitätsmarken trafen zu dem Zwecke Parallereignisse feststellen zu können.

2225 7) Photophonetischer Begleitfilm nach Ansprnch 1) dadurch gekennzeichnet, dass die Gesetzmäshigkeit im Forthbewegungsverhältnis der beiden Filme durch Perforation auch des Begleitfilms mit erreicht wird.

MBR

American Consular Service

German Reich,)
Province of Brandenburg,)
2226 Consulate General of the)ss.
United States of America)
at Berlin.)

I, John F. Stone, Vice Consul of the United States of America at Berlin, German Reich, duly commissioned and qualified, do hereby certify that Lübcke whose true signature and official seal are, respectively subscribed and affixed to the foregoing instrument, was at the time of subscribing same an official of the Government Patent office of the German Reich, duly commissioned and by law authorized to execute such acts, and that his signature and official

Plaintiff's Exhibit No. 32. 2227

seal affixed thereto are genuine, and as such are entitled to full faith and credit.

In Witness Whereof I have hereunto set my hand and the seal of the Consulate General at Berlin, German Reich, this 6th day of October, 1932.

John F. Stone,
Vice Consul of the United States of America.

Service No. 05972
$2.-Mk.8.48

(Seal) 2228

(Translation by George C. O. Haas, Ph. D., New York.)

Certificate.

Messrs. Hans Vogt, of Berlin-Schöneberg, Joseph Massolle, of Berlin-Friedenau, and Dr. Joseph Engl, of Berlin-Grunewald, filed in Germany, at the National Patent Office, on April 2, 1919, an application for a patent of invention on 2229

"Photophonetic accompanying film for silent pictorial actions".

The paper attached hereto is a correct and exact transcript of the original basic document of this patent application.

Berlin, October 5, 1932.

The President of the National Patent Office.

By authority,
(Signed) Lübcke.

V. 14,634 IX/57 a 2.

2230 *Plaintiff's Exhibit No. 32.*

Phonetic Accompanying Film for Silent Pictorial Actions.

In the domain of "silent" cinematography the necessary elucidations of pictures have hitherto been provided either acoustically by reciting persons or optically by concomitant projection of legends, intervening pictures, or the like. In most instances the silent presentation of pictures was also vivified by the playing of
2231 orchestras or of mechanical musical apparatus.

The drawbacks of these means of elucidation and vivification are well known.

In the domain of "sound" cinematography, in processes which render possible, simultaneous with the cinematographic recording, also a photographic fixation of the tones and employ novel electroacoustic means of reproduction, the defects mentioned above are abolished. Practical experience showed, however, that in a series of cinematographic expedients the synchronous concomitant recording of the tonal
2232 event at the taking of the pictures is in part not desirable and in part impossible. For example, it would not be advantageous to phonograph an actor or actress who was successful in the presentation of pantomines, but was equipped with a poor speaking voice. Furthermore, in open-air scenes the acoustics may frequently be so poor that it is necessary to dispense with immediate concomitant recording of the scenic sounds. In the case of humorous recordings, for example talking animals, tricks, etc., a recording of the sound is in any event impossible.

Plaintiff's Exhibit No. 32. 2233

The present invention relates to a phonetic accompanying film whose photograms are based, not on the original sound-events of the photographed scene, but on those of other sources of sound which are appropriately chosen so as to be more favorable. By this means it becomes possible to provide pictures, silent cinematograms, theatrical presentations, etc. with any desired phonetic elucidation and musical adornment.

The production of this accompanying film, 2234
which has to be only relatively synchronous, may, as shown by several specimens of execution, be effected in more or less the following manner.

In cinematographic recordings of the original plastic scene there is desmodromically coupled with the feed mechanism of the apparatus for the taking of the serial pictures the film-winding drum of a special acoustograph. The sources of sound which serve for elucidation, adornment, and vivification of the optical action, such as vocal performers, musical instruments, noise 2235
machines, and the like, are stationed in an acoustically favorable manner outside of the pictorial angle of the objective and come into action at the commencement of the action, with constant appropriate reference to it.

If, at the time of the cinematographic original recording, for any reasons whatever (for example, a storm), the taking of the accompanying film is impossible, this may also take place at the reproduction of the completed picture film, with expedients which are similar to those sketched above. In this case the feed mechanism

2236 *Plaintiff's Exhibit No. 32.*

of the reproduction apparatus would have to be coupled with that of the acoustograph.

The further treatment of the picture films, after the exposure has taken place, is in both cases the usual one as regards the copying process, the reproducing, etc. If the accompanying film had in the recording the same speed of travel as the picture film, then the two series of events may for reasons of expediency also be copied on one film strip for the reproduction.

2237 In addition to being produced by the means sketched above, phonograms for elucidation and vivification of pictures, for example film titles, letters, music solos, and the like, naturally also admit of being produced separately and combined after the manner of picture films to form copiable acoustic series.

In order to recognize in the treatment particular film places which belong together in action and in tone, it is further necessary to provide the two interrelated films, at particular intervals, with marks or numbers.

2238

PATENT CLAIM.

1. Photophonetic accompanying film, produced by means of transverse illumination, for silent pictures or actions, characterized by the fact that its recording is accomplished independently of the sounds accompanying the original optical event.

2. Photophonetic accompanying film in accordance with claim 1, characterized by the fact that at the cinematographic original recording

Plaintiff's Exhibit No. 32. 2239

it is impressed with the use of sources of sound which are not (or only in part) those due to the scenes.

3. Photophonetic accompanying film in accordance with claim 1, characterized by the fact that it is produced, with the use of appropriate sources of sound, at the sight of the picture film while it is being reproduced.

4. Photophonetic accompanying film in accordance with claim 1, characterized by the fact 2240
that it consists of individual series of photophonograms which are separately produced and appropriately joined to one another in succession.

5. Photophonetic accompanying film in accordance with claim 1, characterized by the fact that the photogram series of the picture film and the accompanying film are copied on one film strip.

6. Photophonetic accompanying film in ac- 2241
cordance with claim 1, characterized by the fact that the picture film and the accompanying film bear spaced identity marks for the purpose of enabling one to ascertain parallel events.

7. Photophonetic accompanying film in accordance with claim 1, characterized by the fact that regularity in the ratio of travel of the two films is attained by means of perforation of the accompanying film as well.

162 Patents

PLAINTIFF'S EXHIBIT No. 33 ABANDONED

NUMBER (Series of 1915),
458636

1921

(EX'R'S BOOK) 272 - 33

DIV. 7

PATENT No.

Name Joseph Massolle, Joseph Engl and Hans Vogt.

of Grunewald and Berlin-Schöneberg

County of

State of Germany.

Invention Phonetic Companion Film for Silent Pictorial Representations.

PARTS OF APPLICATION FILED.	ORIGINAL	RENEWED
Petition	Apl 4, 1921	, 192
Affidavit	" " , 1921	, 192
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Division of App., No. , filed , 19

Attorney Munn & Co. 625 F. N. W. City.

Associate Attorney Ward, Coates & Smith 238 Broadway New York City

(No. of Claims Allowed) Print Claims in O. G. (Cl.)

Title as Allowed

Verein. Staaten
von Nord-Amerika

Patente

Case 13

1,493,648

Petition

TO THE COMMISSIONER OF PATENTS:

Your petitioner s, Joseph MASSOLLE, Dr. Joseph ENGL and Hans VOGT, citizens of the German Republic and resident of the first and second of Grunewald, the third of Berlin-Schöneberg, Germany,

Sub
Sub Spec

whose post-office address is the 1st: 60 Cunostrasse, Grunewald, the 2nd: 17 Orberstrasse, Grunewald, the 3rd: 9 Königsweg, Berlin-Schöneberg, Germany,

pray that Letters Patent may be granted to them for the improvement in

PHONETIC COMPANION FILM FOR SILENT PICTORIAL REPRESENTATIONS

set forth in the annexed Specification.

And they hereby appoint Charles A. Munn & Orson D. Munn constituting the firm of Munn & Co. of the cities of New York N.Y. & Washington D.C. its accredited agents their Attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the Letters Patent, to transact all business in the United-States Patent Office connected therewith, and to sign his name to the drawings.

Signed at Berlin in the County of Prussia and State of Germany this 5th day of March 1921.

Joseph Massolle
Dr. Josef Engl
Hans Vogt

Specification

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN That we, Joseph MASSOLLE, ~~Dr.~~ Joseph ENGL and Hans VOGT, citizens of the German Republic residing at the ~~x~~first and second of Grunewald, the third of Berlin-Schöneberg, Germany, have invented certain new and useful improvements in

PHONETIC COMPANION FILM FOR SILENT PICTORIAL REPRESENTATIONS

of which the following is a specification

In the domain of "silent" kinematography the necessary explanations of the pictures have hitherto been given either acoustically by narrators or optically by the conjoint projection of titles, intermediate pictures or the like. In most cases the silent exhibition of the pictures has been enlivened by the playing of orchestras or mechanical musical instruments .

The disadvantage of this means of explanation and enlivement are well known .

In the domain of sounding kinematography the above mentioned disadvantages are obviated with the methods which simultaneously with the kinematographic recording enable also a photographic ~~fixation~~ production of the sounds and which utilise novel electroacoustical means of reproduction. Practice has shown however that in a group of succeeding kinematographic steps the synchronous conjoint recording of the sound incidents accompanying the taking of the picture is either not desirable and not possible. Thus for example it is not advantageous to phonograph a playing Figure which works well in the representation of a pantomime but has a bad speaking organ. Furthermore in open scenes the acoustics may be so bad that the direct conjoint recording of the scenic noises has to be abandoned. In the case of comic scenes, e-g- talking animals, take-ins, etc. the recording of the sounds is as good as impossible .

The present invention relates to a phonetic companion film, the photogramms of which are not based on the original sound incidents of the scene which is being photographed but ~~these~~ on other sources of sound which are more favourably selected in accordance with facts of the case. By this means it is possible to provide pictures, silent kinema-

tograms, theatrical performances etc. with any desired kind of audible explanation and musical adornment .

The production of this companion film which must be absolutely synchronous only conditionally, can be effected in the following manner explained by a few examples .

When the original plastic scene is recorded kinematographically the film winding up drum of a separate acoustograph is positively coupled to the feed mechanism of the recording apparatus for the series pictures. The sources of sound for the explanation, ornamentation and enlivement of the optical representation , such as lecturers, musical instruments, noise machines and the like are ~~ported~~ in an acoustically favourable position outside the angle of the picture thrown by the objective and commence to work at the beginning of the representation and in a relationship therewith which is always in accordance with the facts of the case .

If the recording of the companion film should not be possible at the time the kinematographic original film is being taken (say owing to a storm) this may be done during the reproduction of the finished film under precautions as above mentioned. In this case the feed mechanism of the producing apparatus would have to be coupled to the acoustograph.

The further treatment of the picture film after exposure is the usual one in both cases as regards the copying process, the reproduction etc. When the companion film had the same speed of feed when taken as the picture film the two records of incidents could be conveniently copied on one film for the reproduction of said incidents .

In addition to the methods above indicated explana-

tions of the pictures and entivenment phonogramms such for example as film titles, letters, musical solos, and the like may naturally also be produced separately and combined into acoustic series which can be copied after the manner of the picture films .

In order to be able to recognise corresponding points on the films which belong together as regards subject and sound it is also necessary to provide the two correlated films with marks or numbers at determined distances.

We claim :-

1.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the recording of the same is effected independently of the sounds which accompany the original optical incident .

2.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the same is exposed at the kinetographic taking of the original to the action of sources of sounds which are not in accordance with the scene .

3.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the same is exposed at the kinetographic taking of the original to the action of sources of sounds which are only partly in accordance with the scene.

4.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the same is produced with the use of sources of sounds in accordance with the facts of the picture films to be reproduced.

5.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the photophonetic companion film is composed of separate, separately produced series of photophonogramms assembled together in accordance with the facts of the case .

6.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the series of photogramms of the picture and companion film are copied on one film .

7.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the picture and companion film carry at determined distances indentification marks for the purpose of enabling parallel incidents to be determined.

8.- A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the ~~pxx~~ uniformity in the ratio of the forward movement of the two films is obtained by perforation also of the companion film .

IN TESTIMONY WHEREOF we affix our signatures in

presence of two witnesses.

Joseph Massolle

fritz Wardanen, Berlin,
Otto Wunsch, Berlin, Lützowstr. 87 b
Kronprinzendamm 2 Dr. Josef Engl Hansbgt

Oath or Affirmation

Berlin
Germany

ss:

Joseph MASSOLLE, Dr. Joseph ENGL and Hans VOGT

the above-named petitioners being duly sworn, depose and say that they are

of

citizens of the German Republic

and residents of the first and second of Grunewald, the third of Berlin-Schöneberg, Germany

that they verily believe themselves to be the original, first and joint

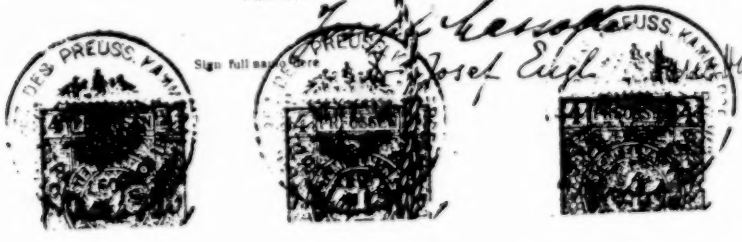
inventors of the improvements in

PHONETICAL COMPANION FILM FOR SILENT PICTORIAL REPRESENTATIONS

described and claimed in the annexed specification; that they do not know and do not believe that the same was ever known or used before their invention or discovery thereof, or patented or described in any printed publication in any country before their invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by themselves or their legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by themselves or their representatives or assigns in any country foreign to the United States except as follows in GERMANY on the 2nd April 1919, in GREAT BRITAIN on the 10th January 1921 and in ITALY on the 29th January 1921 .

Joseph Massolle

Sign full name here Dr. Josef Engl Hansbgt



Div. 7 Room 312 2-200 V Paper No. 2

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications relating to this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON April 13, 1921

Munn & Co.

625 F St. N. W.

Washington, D. C.

APR 13 1921

Please find below a communication from the EXAMINER in charge of the application of

J. Massole, J. Engl, and H. Vogt, filed Apr. 4i, 1921,

Phonetic Companion Film etc., Serial No. 458,636

Thomas E. Robertson
Commissioner of Patents.

All claims are rejected as not proper method claims. They do not point out any method. No art can be cited until a better disclosure is made; the patent to

Hopkins 1,286,638 Dec. 3, 1918
88-16.2

appears the nearest to what is understood to be intended.

A new oath is required for the following reasons. The jurat is not in the English language, there is no Consular certificate and the name of second inventor, Engl, varies. New papers are required as the ribbon has been cut and tied together again.

The method appears to be capable of illustration. Such illustration is accordingly required.

The specification is full of obvious inaccuracies and should be carefully revised.

W.J.W.

Examiner.

CRW

A--5

CRW:D

MAR 17 1922

IN THE UNITED STATES PATENT OFFICE

In re application,

J. Massole, J.Engl

and H. Vogt,

Filed April 4,1921, Div. 7 Room 312

Phonetic Companion
Film,etc.

Serial No. 458, 636 March 13,1922.

HON. COMMISSIONER OF PATENTS,
WASHINGTON,D.C.

SIR:

Responsive to the Office letter of April 13,1920.

Erase "fixation" line 13, page 1 and insert --production--.

Correct the spelling of "utilize" line 14, same page.

Same page, line 15, correct the spelling of "practice".

Same page, line 25, change "impossible" to --possible--.

Same page, line 29, erase "those of" and insert --on--.

Erase "only conditionally" line 4, page 2 and insert --will the picture film--.

Same page, line 5, erase "explained by a few examples".

Same page, line 8, before "is" insert --film--.

Same page, line 12, erase "posted" and insert --arranged--.

Insert the following after line 5, page 3:

"In the drawing is shown a film formed according to the invention, and wherein a represents the picture portion of the film and b the sound producing portion at the longitudinal edge of the picture portion outside of the perforations thereof. As before pointed out the sound producing portion b is formed separately from picture portion a and by sounds other than the sounds of the pictures thereof and the two are copied upon one and the same film band".

Erase the claims and insert:--

1. The method herein described of producing a combined picture and sound producing film consisting in producing the photograms on the film by sounds other than the sounds of the pictures.

2. The method herein described of producing a combined picture and sound producing film, consisting in producing two separate films, and then reproducing the two films on a single band.

3. The method herein described of producing a combined picture and sound producing film, consisting in forming a picture film, forming a sound producing film by sounds other than the sounds of the pictures of the picture film, and then reproducing the said films on a single band.

4. A moving picture film having a sound producing film extending along one outer longitudinal edge thereof outside of the perforations thereof.

5. A moving picture film having a sound producing film extending along one longitudinal edge outside of the perforations thereof, the photograms of the sound producing film being produced by sounds other than the sounds of the pictures.

R E M A R K S

A drawing is herewith filed.

A new oath will in due course be filed.

New claims 1,2 and 3 are thought to be for a legitimate method, and claims 4 and 5 for the film, are thought allowable in the same application with the method claims. The claims are thought to cover patentable subject matter and early and favorable action is respectfully requested.

Respectfully submitted,

J. MASSOLE, etal

By Munn Reo

Attorneys.

Div. 7 Room 312 2-260 V Paper No. 2

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications requesting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON March 18, 1922

Munn & Co.

625 F St. N. W.

Washington, D. C.

MAR 18 1922

Please find below a communication from the EXAMINER in charge of the application of

Massolle, Engl and Vogt, filed Apr. 4, 1921, Phonetic Companion Film etc., Serial No. 458,636

Thomas E. Robertson

Commissioner of Patents.

Case reconsidered as amended March 15, 1922.

The requirement for a new oath and uniformity of name of the second inventor is repeated.

Claims 1 to 3 are rejected on Hopkins of record. See especially lines 91 to 99 of page 2, lines 26 to 29 on page 4.

Claims 1 to 3 are further rejected on

Hopkins 1,302,367 Apr. 29, 1919 88-16.2

Claim 4 is rejected on the French patent to

Canton 459,637 Sept. 2, 1913 (1 sheet) 88-16.2

Claim 5 is rejected on Canton in view of either patent to Hopkins and is further rejected as defining an object by the process of making it.

Claims 1, 3 and 5 are objected to as vague and indefinite. What is meant by "sounds of the picture"?

Claims 1, 3 and 5 are further rejected as attempting to distinguish by a negative limitation.

The preamble should be amended to recite applicant's foreign applications.

W.J...

Examiner.

APPLICATION ROOM
OCT
26
1922

In the matter of the application of JOSEPH MASSOLLE, JOSEF ENGL and HANS VOGT, for patent for PHONETIC COMPANION FILM FOR SILENT PICTORIAL REPRESENTATIONS, filed April 4, 1921, Serial No.458636

P E T I T I O N.

TO THE COMMISSIONER OF PATENTS:

Your petitioners, JOSEPH MASSOLLE and JOSEF ENGL, residents of Grunewald, Germany, and HANS VOGT, resident of Berlin-Wilmersdorf, Germany, citizens of the German Republic, whose post-office addresses are, JOSEPH MASSOLLE, 60 Cunostrasse, Berlin-Grunewald, Germany, JOSEF ENGL, 52 Hohenzollerndamm, Berlin-Grunewald, Germany, and HANS VOGT, 49 Babelsbergerstrasse, Berlin-Wilmersdorf, Germany, pray that Letters Patent may be granted to them for improvement in PHONETIC COMPANION FILM FOR SILENT PICTORIAL REPRESENTATIONS set forth in the above entitled application; and they hereby appoint CHARLES A. MUNN and ORSON D. MUNN, constituting the firm of MUNN & CO., of the Cities of New York, N.Y., Washington, D.C., Chicago, Ill. and San Francisco; Cal.; or accredited agents, their Attorneys, with full power of substitution and revocation, to prosecute the above entitled application, to make alterations and amendments therein, to receive the patent, to transact all business in the Patent Office connected therewith, and to sign their name to the drawings.

Signed at Berlin Germany by the said Joseph Massolle, this ninth day of March 1922.

Joseph Massolle

Signed at Berlin Germany by the said Josef Engl, this ninth day of March 1922.

Dr. Josef Engl

Signed at Berlin Germany by the said Hans Vogt. this ninth day of March 1922.

Hans Vogt

TO ALL WHOM IT MAY CONCERN:

Be it known that we, JULIUS MACSOLLY, JOSEF PEIL, and HANS VOGT, citizens of the German Republic and residents respectively, the first and second of Berlin-Grunewald, the third of Berlin-Tiergarten, Germany, have invented a new and improved

PHONETIC COMBINATION FILM FOR SILENT PICTORIAL REPRESENTATIONS

of which the following is a full, clear and exact description.

In the domain of "Silent" kinematography the necessary explanations of the pictures have hitherto been given either acoustically by narrators or optically by the conjoint projection of titles, intermediate pictures or the like. In most cases the silent exhibition of the pictures has been enlivened by the playing of orchestras or mechanical musical instruments.

The disadvantage of this means of explanation and enlivenment are well known.

In the domain of sounding kinematography the above mentioned disadvantages are eliminated with the methods which simultaneously with the kinematographic recording

erally also a photographic fixation of the sounds and which utilize novel electroacoustical means of reproduction. Practice has shown however that in a group of succeeding kinematographic steps the synchronous conjoint recording of the sound incidents accompanying the taking of the picture is either not desirable and not possible. Thus for example it is not advantageous to phonograph a playing figure which works well in the representation of a pantomime but has a bad speaking organ. Furthermore in open scenes the acoustics may be so bad that the direct conjoint recording of the scenic noises has to be abandoned. In the case of comic scenes, e.g. talking animals, take-ins, etc., the recording of the sounds is as good as impossible.

The present invention relates to a phonetic companion film, the photogramms of which are not based on the original sound incidents of the scene which is being photographed but those of other sources of sound which are more favourably selected in accordance with facts of the case. By this means it is possible to provide pictures, silent kinematogramms, theatrical performances etc., with any desired kind of audible explanation and musical adornment.

The production of this companion film which must be absolutely synchronous only conditionally, can be effected in the following manner explained by a few examples.

When the original plastic scene is recorded kinematographically the film winding up drum of a separate

acoustograph is positively coupled to the feed mechanism of the recording apparatus for the series pictures. The sources of sound for the explanation, ornamentation and enlivement of the optical representation, such as lecturers, musical instruments, noise machines and the like are posted in an acoustically favourable position outside the angle of the picture thrown by the objective and commence to work at the beginning of the representation and in a relationship therewith which is always in accordance with the facts of the case.

If the recording of the companion film should not be possible at the time the kinematographic original film is being taken (say owing to a storm) this may be done during the reproduction of the finished film under precautions as above mentioned. In this case the feed mechanism of the producing apparatus would have to be coupled to the acoustograph.

The further treatment of the picture film after exposure is the usual one in both cases as regards the copying process, the reproduction, etc. When the companion film had the same speed of feed when taken as the picture film the two records of incidents could be conveniently copied on one film for the reproduction of said incidents.

In addition to the methods above indicated explanations of the pictures and enlivenment phonogrammes such for example as film titles, letters, musical solos, and the like may naturally also be produced separately and combined into acoustic series which can be copied after the manner of the picture films.

In order to be able to recognize corresponding points on the films which belong together as regards subject and sound, it is also necessary to provide the two correlated films with marks or numbers at determined distances.

We claim:

1. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the recording of the same is effected independently of the sounds which accompany the original optical incident.

2. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the same is exposed at the kinetographic taking of the original to the action of sources of sound which are not in accordance with the scene.

3. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the same is exposed at the kinetographic taking of the original to the action of sources of sounds which are only partly in accordance with the scene.

4. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the same is produced with the use of sources of sounds in accordance with the facts of the picture films to be reproduced.

5. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the photophonetic companion film is composed of separate, separately produced series of photophonogramms assembled together in accordance with the facts of the case.

6. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the series of photogramms of the picture and companion film are copied on one film.

7. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the picture and companion film carry at determined distances indentification marks for the purpose of enabling parallel incidents to be determined.

8. A method for producing photophonetic companion films for silent pictures or representations by transverse exposure according to which the uniformity in the ratio of the forward movement of the two films is obtained by perforation also of the companion film.

Joseph Tannenberg

Dr. Josef Engl

Hans Vogt

Witnesses:

.....

John W. Bulkley

PATENT OFFICE
OCT
3
1922

In the matter of the application of JOSEPH MASSOLLE, JOSEF ENGL and HANS VOGT, for patent for PHONETIC COMPANION FILM FOR SILENT PICTORIAL REPRESENTATIONS, filed April 4, 1921, Serial No.458.636.

O A T H.

JOSEPH MASSOLLE and JOSEF ENGL, residents of Berlin-Grunewald, Germany, and HANS VOGT, resident of Berlin-Wilmersdorf, Germany, the above named petitioners being sworn depose and say: that they are citizens of the German Republic; that they verily believe themselves to be the original, first and joint inventors of the improvement in PHONETIC COMPANION FILM FOR SILENT PICTORIAL REPRESENTATIONS described and claimed in the above-entitled application; that they do not know and do not believe that the same was ever known or used before their invention or discovery thereof, or patented or described in any printed publication in any country before their invention or discovery thereof, or patented or described in any printed publication or in public use or on sale in the United States prior to the filing of any foreign application by them or their legal representatives or assigns; and that no application for patent on said improvement has been filed by, nor patent granted to, them or their legal representatives or assigns in any country foreign to the United States, except as follows:

Germany, April 2, 1919; Great Britain, January 19, 1921; Italy, January 29, 1921; and that the petitioners' full names are as above written.

Joseph Marcella

Dr. Jos. Engl

Hans Vogt

9th

Sworn

Marcella

C W Turrell

Vice

Service #1094

#2

Amendment

8

APPLICATION ROOM U.S. PATENT OFFICE OCT 28 1922

CRW:MK

IN THE UNITED STATES PATENT OFFICE.

In re application of :

Massolle, Engl and Vogt :

Phonetic Companion Film etc. : Room 312

Filed April 4, 1921 : Div. 7

Serial No. 458,636 :

----oooOooo----

OCT 27 1922

Hon. Commissioner of Patents,

Washington, D. C.

S I R:

In response to the Office Letter of March 16, 1922, amend the above entitled application as follows:

Substitute the papers filed herewith for the original papers and enter amendments of March 15, 1922 therein and in the preamble before "of which" insert --for which I have made applications Germany April 2, 1919, Great Britain January 10, 1921, and Italy January 29, 1921--

B1

Erase "other than the sounds of the picture" lines 3 and 4, claim 1 and insert --which are recorded for for the sound film independently of the picture film--

B2

Erase "other than the sounds of the picture" line 4, claim 3 and insert --which are recorded for the sound film independently--

B3

Erase "other than the sounds of the picture" lines 4 and 5, claim 5 and insert --which are recorded for the sound film independently of the picture film--

B4

Erase claim 4 and change the ordinal of claim 5 to 4.

R E M A R K S.

New papers have been filed as required. Claims

1, 3 and 4 (former 5) as amended are thought to be free from the objections noted. Claims 1, 2 and 3 are thought to distinguish the invention from the patents of Hopkins.

The statements in patent 1,286,638, page 2, lines 91-99 and page 4, lines 26-29 say that a picture film can be accompanied by music which however has not any direct relation to the film.

These musical records are made mechanically according to the said patent so that there is no question of recording pictures and sounds photographically independently the one of the other and to reproduce the same. Also patent 1,302,367 relates to the recording and reproduction of acoustic vibrations mechanically by means of the gramophone, phonograph or the like. It is quite correct that such a mechanical recording device can be used independently of the recording of the pictures, but this has nothing to do with the present invention.

Claim 4 (former 5) is not anticipated by French patent 459,537, as this patent describes an arrangement in which the sound and the picture are reproduced simultaneously and in dependence the one of the other. Claim 4 claims, however, the use of marks outside the perforations of a film band, which contains sound and picture recorded separately.

The Official draftsman has been requested to correct the signature of Engl to the drawing.

A reconsideration and allowance of the application is respectfully requested.

Respectfully submitted,
MASSOLE, ENGL AND VOGT

BY.....Attys.

Washington, D. C.

Div. 7 Room 312 2-260 V Paper No. 8

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON Nov. 11, 1922

NOV 11 1922

Munn & Co.

625 F St. N. W.

Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of

Moeslle, Engle and Vogt, filed Apr. 4, 1921, Phonetic Companion Film etc., Serial No. 488,636

Thomas E. Robertson

Commissioner of Patents.

Case reconsidered as amended Oct. 28, 1922.

Owing to confusion which has arisen due to the filing of substitute papers, applicants are requested to rewrite all claims now in the case.

A brief description of the figure should be inserted in the substitute papers.

It is old as shown in the references of record to have a film having a sound record and a motion picture record. These have been shown to be synchronized and the problem has been to obtain synchronization. However the sound record and the picture record are made on separate films and then combined. It is old to make sound records without picture records and picture records without sound records. These may be combined without involving invention. In the Hopkins patent the sounds and pictures are separate. Whether the sound is produced from a phonograph record or any other form of record is immaterial.

In the patent 1,302,367 there is a sound record and a picture record made at separate times. The sound record is not made on the film but Canton of record shows that it is old to

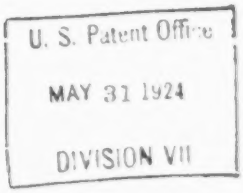
make a sound record on the film. For this reason there is no invention in putting the record of Hopkins on the film in view of Canton.

No particular means or apparatus for making the film sound record are shown and it appears this is done according to the old method. The essence of the case seems to be in the use of a motion picture record and a harmonizing sound record which was not made at the same time. This is exactly what Hopkins shows. For this reason the claims seem to be fully anticipated and applicant should put his case in condition for final action.

Examiner.

A J W

11-11-22 R
Encl. Power of Atty
10



UNITED STATES PATENT OFFICE.

JOSEPH MASSOLLE, :
JOSEF ENGL, : Div.7
HANS VOGT, : Room 312
Serial No. 456,630, :
Filed April 4, 1921. :
Phonetic COmpanion Film for :
Silent Pictorial Representations. :

To the Commissioner of Patents,
Washington, D.C.

Sir:

The undersigned, attorneys of record in the above entitled application, hereby appoint Messrs. Ward, Crosby & Smith, (Reg. No. 11657), a firm composed of S. Mortimer Ward, Jr., Gorham Corsby and Dyer Smith, of 233 Broadway, New York, N.Y., as associate attorneys in said application, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Vincent Bo

Signed at New York, N.Y.

May 27 1924.

MAIL ROOM AUG 1924 U.S. PATENT OFFICE

UNITED STATES PATENT OFFICE.

DIVISION AUG 2 1924 U.S. PATENT OFFICE

JOSEPH MASSOLLE
JOSEF ENGL
HANS VOGT.

Serial No. 456,339.

Filed April 4, 1921.

Phonetic Companion Film for Silent Pictorial Representations.

Div. 7

Room 512

Hon. Commissioner of Patents,

Washington, D.C.

Sir:

The undersigned hereby revoke all previous Powers of Attorney in connection with the above entitled application.

The undersigned hereby appoint Messrs. Ward, Crosby & Smith, a firm composed of S. Mortimer Ward, Jr., Gorham Crosby and Dyer Smith, (Registration No. 11657), of No. 233 Broadway, New York, New York, its attorneys, with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent and to transact all business in the Patent Office connected therewith.

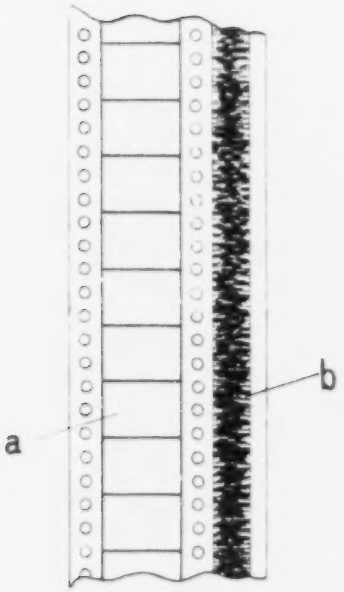
Josef Engl.

Hans Vogt

Joseph Massolle

We agree to the above revocation of our Power of Attorney.

Ward & Co



INVENTORS
Joseph Massolle
Joseph Engl
Hans Vogt
BY
Munn & Co
ATTORNEYS

2323

Plaintiff's Exhibit No. 34.

(Stamp)

Dr. Gerhard Jacoby
Notar I. Bez. des Preuss.
Kammergerichts
M. Beglaubigte Abschrift!
33.Q.29
6

Im Namen des Volkes!

2324

Verkündet
am 1. März 1929
gez. Zeiss, Angestellter,
als Urkundsbeamter
der Geschäftsstelle.

In Sachen

der Firma Tonbild-Syndikat Aktiengesellschaft in Berlin, Jägerstrasse 6,
vertreten durch ihren Vorstant: Dr. Hans Henkel and Arthur Frischknecht,

2325

Antragstellerin,

—Prozessbevollmächtigter: Rechtsanvalt Theodor Kallmann in Berlin SW.47, Yorkstrasse 76—

gegen

die Firma Klangfilm—G.m.b.H. in Berlin, Askanischer Platz 4,
vertreten durch ihre Geschäftsführer Dr. Kirn and Dr. Akemann,

Antragsgegnerin,

2326 *Plaintiff's Exhibit No. 34.*

—Prozessbevollmächtigte: Rechtsanwälte Dr. Danziger und Dr. Nünninghoff in Berlin W.10, Margaretenstrasse 8—wegen Patentstreits—Streitwert 100.000RM—

hat die 16. Zivilkammer des Landgerichts I in Berlin auf die mündliche Verhandlung vom 22. Februar 1929 under Mitwirkunk des Landgerichtsrats Dr. Hamburger, des Amts—und Landrichters Kopf und des Gerichtsassessors Dr.
2327 Knapp für Recht erkannt.

Die einstweilige Verfügung vom 8. Februar 1929 wird bestätigt und die Antragsgegnerin verurteilt, auch die weiteren Kosten des Verfahrens zu tragen.

TATBESTAND:

Die Antragsstellerin ist Generallizenznehmerin des mit Wirkung vom 15. April 1921 erteilten DRP. 368 383, dessen Anspruch 1. lautet:

2328 "Verfahren zum Herstellen von Positivfilmen, welche Bildreihen und photographisch aufgenommene Tonschrift enthalten, dadurch gekennzeichnet, dass die Negative getrennt entwickelt werden".

Auf die Patentschrift wird verwiesen.

Die Antragstellerin trug vor, die Antragsgegnerin sei im Begriff, am 8. Februar 1929 Tonbildfilme vorzuführen, die von der General Electric Comp. (sogenannte photophone-Filme) hergestellt seien. Die Herstellung dieser Filme er-

folge, wie aus dem Buch "TRANSACTIONS OF THE SOCIETY OF MOTION PICTURE ENGINEERS" Site 87 hervorgehe, in der Weise, dass der Tonfilm und der Druckfilm einzeln aufgenommen, entwickelt, dann zusammen in einer Kopiermaschine vereinigt würden, so dass eine kombinierte Kopie auf einem einzigen Film erzeugt werde. Diesen Verfahren falle unter das DRP. 368 383. Bei der jungen Entwicklung dieses Industriezweiges sei für die Antragsstellerin eine besondere Gefahr durch solche Patentverletzungen gegeben. 2329 2330

Die Antragsstellerin erwirkte auf Grund dieses Vortrages die einstweile Verfügung vom 8. Februar 1929, durch welche der Antragsgegnerin verboten wurde, "ein Verfahren zum Herstellen von Positivfilmen, welche Bildreihen und photographisch aufgenommene Tonschrift enthalten, anzuwerden", bei welchem die Negative getrennt entwickelt werden. Die Antragsgegnerin legte gegen dieses einstweilige Verführung Widerspruch ein.

Die Antragsstellerin beantragt: 2331

die einstweilige Verfügung zu bestätigen.

Die Antragsgegnerin beantragt:

die einstweilige Verfügung insoweit aufzuheben, dass hinter dem Wort "welche" eingefügt würden die Worte: "auf *einem* Filmband".

Sie trägt vor, sie wolle vorerst die einstweilige Verfügung im übrigen nicht angreifen, jedoch sei die Formel unklar. Man könne zunächst meinen, dass sie nur Filme behandle, auf denen zugleich Ton- und Bildfilme enthalten seien. Indessen richte die Antragsstellerin nach der Be-

2332 *Plaintiff's Exhibit No. 34.*

gründung ihres Antrags sich auch gegen Filme, welche die Antragsgegnerin in Deutschland herstelle. Diese aber würden so hergestellt, dass stets Ton und Bild sich aufgetrennten Filmstreifen befänden, und zwar sowohl bei der Aufnahme alsauch beim Entwickeln, Kopieren und Abrollen. Dieses Herstellungsverfahren dürfe durch die einstweilige Verfugung nicht verboten werden, zumal es durch die überreichte britische Patentschrift 105 589 bereits bekannt gegeben sei. Die Antragsstellerin have gleichwohl auf
2333 die Anfrage der Antragsgegnerin, ob sie Rechte aus der einstweiligen Verfügung gegen Tonfilme herleite, soweit Ton und Bild von getrennten Filmstreifen abrollten, keine befriedigende Antwort gegeben. Bei dieser Sachlage sei es unbedingt notwendig, die Formel der einstweiligen Verfügung zu ändern.

Die Antragsstellerin ist dem entgegengetreten. Es wird im übrigen auf den vorgetragenen Inhalt der Schriftsätze und der zur Glaubhaftmachung überreichten Anlagen verwiesen.

2334 *Entscheidungsgründe:*

Die Antragsgegnerin bestreitet das Vorliegen eines Arrestgrundes nicht. Tatsächlich ist dieser auch gegeben, da gerade die Tonfilm-Industrie in starker Entwicklung ist, und gerade jetzt Patentverletzungen der Antragsstellerin unabsehbaren Schaden bringen könnten.

Ebenso kann an sich der Arrestanspruch nicht bestritten werden. Nach dem DRP. 368 383 ist es von grossem Vorteil, die Tonschrift und die Bildreihe by sprechenden Filmen auf einem gemeinsamen Träger, ein Filmband aufzubringen. Schwierigkeiten ergeben sich aber hierbei in-

sofern, als bei der Aufnahme die Bildreihe über- oder unterbelichtet werden kann, während die Tonzeichenreihe stets normal belichtet ist. Diese Unterschiede lassen sich beim Entwickeln nicht ausgleichen. Der Erfinder setzte sich also die Aufgabe, diese Schwierigkeiten zubeheben und löst diese Aufgabe dadurch, dass die Negative getrennt entwickelt werden. Hierbei ist es gleichgültig, ob die Aufnahme schon getrennt erfolgt oder ob sie auf einem Film vorgenommen wird, der zum Entwickeln geteilt wird. Ebenso ist es gleichgültig, ob die Herstellung des einheitlichen Positivfilmes dadurch erfolgt, dass man die beiden Negativfilme nacheinander auf dem gleichen Positivfilm kopiert oder ob man die beiden Negativfilme vorher miteinander verklbt, und nun die Kopie auf einmal vornimmt. 2335 2336

Hiernach erstreckt sich der Schutzbereich des Patents auf ein Verfahren zum Herstellen von Positivfilmen, welche sowohl Bildreihen als auch Tonschrift enhalten, bei welchen die Negative getrennt entwickelt werden. Auch der Stand der Technik steht dieser Auslegung nicht entgegen, soweit bisher von der Antragsgegnerin Material überbracht ist. Die britische Patentschrift 105 589 beschreibt ein Verfahren, bei welchem sowohl bei der Aufnahme wie beim Entwickeln und Kopieren getrennte Bild- und Tonfilme vorhanden sind. Auch das Abrollen der Filme erfolgt nach dieser Patentschrift in der Regel getrennt unter synchroner Zasammenfassung. Lediglich Seite 6, Zeile 30 bis 32, ist die Möglichkeit erwähnt, die beiden Positivfilme nach der Kopie und vor dem Abrollen an den überhängenden Kanten zusammenzukleben, so dass tatsächlich ein Film da ist. Bis zum Stadium des Abrollens 2337

2338 *Plaintiff's Exhibit No. 34.*

kennt jedenfalls diese Patentschrift keinen gemeinsamen Film.

Bei dieser Auslegung des Klagepatents besteht kein Zweifel, dass das Verfahren, welches die General Electric Comp. nach dem überreichten Artikel anwendet, unter das Klagepatent fällt, da bei diesem Verfahren die Filme zwar getrennt aufgenommen und entwickelt, aber bei der Kopie vereirigt werden, so dass also Positivfilme vorhanden sind, welche Bildreihen und Tonschriften enthalten, und bei denen die Negative
2339 getrennt entwickelt sind. Dieses Verfahren fällt klar unter den Wortlaut des Patentanspruchs 1, so dass das diesem Anspruch entsprechende Verbot der einstweiligen Verfügung den Verletzungsfall klar beschreibt.

Die Antragsstellerin meint, diese Fassung sei unklar, da hierunter auch Verfahren fallen könnten, bei denen Aufnahme, Entwicklung, Kopie und Abrollen auf getrennten Filme erfolge. Dem kann nicht beigetreten werden. Die Antragsstellerin selbst hat in der müundlichen Verhandlung erklärt, dass sie ein solches Verfahren nicht
2340 als unter das Patent fallend ansehe. Dies wäre auch nach dem Stande der Technik infolge der britischen Patentschrift 105 589 nicht möglich. Liest man aber den Wortlaut der einstweiligen Verfügung unbefangen, so fällt ein solches Verfahren auch nicht darunter, weil nach diesem immer Positivfilme vorausgesetzt sind, welche Bildreihen und photographisch aufgenommene Tonschrift enthalten, d.h. jeder Film muss beides enthalten.

Die Antragsstellerin stüzt nun ihr Verlangen auf Berichtigung des Tenors darauf, dass die Antragsgegnerin ihr keine befriedigende Ant-

wort auf ihre Anfrage gegeben have. Allein die Antragsstellerin war hierbei durchaus im Recht, denn in der Anfrage der Antragsgegnerin, die in der mündlichen Verhandlung verlesen ist, steht nicht das ganze Verfahren der Antragsgegnerin beschrieben, sondern es war nur angefragt, ob getrennt abrollende Filme unter der Verfahren fielen. Diese Anfrage konnte aber die Antragsstellerin nicht beantworten, da das getrennte Abrollen allein nicht genügt, um aus dem Patent herauszukommen, wenn in einem früheren Stadium des Verfahrens, etwa bei der Kopie, ein gemeinsamer Film vorhanden war, der zum Abrollen getrennt wird. Ein solches Verfahren würde, soweit der Standpunkt der Technik bisher zu übersehen ist, ebenfalls unter das Patent der Antragsstellerin fallen. Infolgedessen könnte die Antragsstellerin nach Lage der Sache vor näherer Klarstellung des Verfahrens der Antragsgegnerin keine befriedigende Antwort geben, ohne dass aus dieser Tatsache auf eine Unklarheit der einstweiligen Verfügung geschlossen werden dürfte.

Nun würde freilich der von der Antragsgegnerin gewünschte Zusatz in die einstweilige Verfügung aufgenommen werden könne wenn er geeignet wäre, die Klarheit der einstweiligen Verfügung zu verstärken und Zweifel im Zwangsvollstreckungsverfahren auszuschliesen. Das ist aber nicht der Fall. Gerade die von der Antragsgegnerin gewünschte Fassung kann zu Zweifeln führen. Wenn nämlich von Positivfilmen die Rede ist, die auf einem Filmband Ton- und Bildfilm enthalten, dann könnte man an das abrollende Filmband denken und infolgedessen bei getrennter Abrollung ohne weiteres annehmen,

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2344 *Plaintiff's Exhibit No. 34.*

dass ein Verstoss gegen die einstweiligen Verfügung nicht vorliegt. Dies ist aber, wie oben gezeight, nicht unbedingt der Fall. Die von der Antragsgegnerin gewünschte Fassung k o m m t also nicht in Frage. Ebenso erscheint es nicht sweckmässig, diese Fassung zu wählen und durch einen weiteren Zusatz am Schluss der Formel bestimmte Ausnahmen zu machen, da denn die eistweilige Verfügung kaum mehr verständlich wäre. Es muss daher bei der bisherigen Verfügung sein Bewenden haben.

2345

Wenn die Antragsgegnerin weiter vorträgt, dass die einstweilige Verfügung bereits zu irreführenden Zeitungsnachrichten beführt habe, so ist nach der Ueberzeigung des Gerichts nicht die Fassung der einstweiligen Verfügung Schuld an derartigen Missverständnissen. Liest man die einstweilige Verfügung unbefangen, dann kann man ohne weiters erkennen, was damit gemeint ist.

Ueber die Kosten entscheidet § 91 ZPO.
gez. Dr. Hamburger, Kopf, Dr. Knapp.

2346

Ausgefertigt
gez. Unterschrift, als
Urkundsbeamter der Geschäftsstelle des
L.S. Landgerichts I.

Ausgefertigt
gez. Unterschrift, Justizsekretär,
als Urkundsbeamter der Geschäftsstelle
des Landgerichts I.

Dass

Dass vorstehende Abschrift mit der mir vorliegenden Ausfertigung des Urteils des Landge-

Plaintiff's Exhibit No. 34. 2347

richts I Berlin vom 1. März 1929 wörtlich übereinstimmt beglaubigt ich hiermit als Notar.

Berlin, am 31. Oktober 1932

Dr. Gerhard Jacoby
(Seal) Notar
im Bezirk des Kammergerichts

Die Unterschrift des Notars Dr. Gerhard Jacoby wird beglaubigt. Der Notar ist zur Beglaubigung der Urkunde befugt. 2348
Die Form entspricht dem deutschen Gesetze.
Berlin-Charlottenburg, den 31ten Oktober 1932.

Der Präsident
des Preussischen Landgerichts III
In Vertretung:

Quäbicker,
(Seal) Landgerichtsdirector.
80.- RM.

2349

Gerichtsgebühren
sind entrichtet.
Langbehn,
justizinspektor,
Landgericht III
German Reich. City of Berlin,

Consulate General of the United States of America, ss.:

I, John F. Stone, Vice Consul of the United States of America, at Berlin, Germany, duly com-

2350 *Plaintiff's Exhibit No. 34.*

missioned and qualified, do hereby certify that Quäbicker whose true signature and official seal are, respectively, subscribed and affixed to the foregoing instrument, was at the time of subscribing the same an official of the Prussian Landgericht III. at Berlin, of the German Reich, duly commissioned and by law authorized to execute such acts, and that his signature and official seal affixed thereto are genuine, and as such are entitled to full faith and credit.

2351 In Witness Whereof I have hereunto set my hand and the seal of the Consulate General at Berlin, Germany, this 1st day of November, 1932.

John F. Stone,
Vice Consul of the United States
of America.

(Seal)

Service No. 06484
$2. — M8.48

2352 ($2.00 Fee Stamp)

Plaintiff's Exhibit No. 34. 2353

CERTIFIED TRANSCRIPT.

(Stamped Seal)

Dr. Gerhard Jacoby
Notary in the District
of the Prussian
Supreme Court.
M.
33.Q.5.29

6

In the Name of the People! 2354

Handed down
March 1, 1929.
(Signed) Zeiss, official,
as document clerk
of the office.

In the matter of

the Tonbild-Syndikat Aktiengesellschaft, of Berlin, Jägerstrasse 6, represented by its Board of Directors, Dr. Hans Henkel and Arthur Frischknecht,

Petitioner, 2355

—Counsel: Attorneys-at-law Theodor Kallmann, of Berlin SW 47, Yorkstrasse 76—

vs.

the Klangfilm G.m.b.H., of Berlin, Askanischer Platz 4, represented by its business managers Dr. Kirn and Dr. Akemann,

Defendant,

—Counsel: Attorneys-at-law Dr. Danziger and Dr. Nünninghoff, of Berlin W 10, Margaretenstrasse 8—

because of patent litigation—value involved in the litigation, 100,000 Reichmarks—,

2356 *Plaintiff's Exhibit No. 34.*

the 16th Civil Chamber of State (Superior) Court I in Berlin, upon the oral hearing of February 22, 1929, the participating justices being Landgerichtsrat Dr. Hamburger, District and State Judge Kopf, and Court Assessor Dr. Knapp, has handed down the following decision:

> The preliminary injunction of February 8, 1929 is confirmed, and the defendant is sentenced to bear the further costs of the proceeding as well.

2357 *Facts.*

The petitioner is a general licensee of German Patent 368,383, issued to be effective from April 15, 1921, claim 1 of which reads:

> "Process for the production of positive films which contain series of pictures and photographically recorded tone record, characterized by the fact that the negatives are developed separately."

Reference is made to the patent.

2358 The petitioner alleged that the defendant was about to present, on February 8, 1929, tone-picture films (so-called Photophone films) which had been produced by the General Electric Company. The production of these films is effected, as appears from the book *Transactions of the Society of Motion Picture Engineers*, page 87, in this manner, that the tonefilm and the pressure film* are exposed and developed separately and are then united in a copying machine, so that a combined copy is produced on a single film.

*[Translator's Note.—The word *Druckfilm*, "pressure film", is probably a clerical error for *Bildfilm*, "picture film".]

Plaintiff's Exhibit No. 34.

This process, it was alleged, falls under German Patent 368,383. In view of the early stage of development of this branch of industry, such patent infringements constitute a special danger for the petitioner. 2359

On the basis of these allegations the petitioner obtained the preliminary injunction of February 8, 1929, by which the defendant was forbidden "to employ a process for the production of positive films which contain series of pictures and photographically recorded tone record," in which process the negatives are developed separately. 2360 The defendant filed an objection to this preliminary injunction.

The petitioner moves that the preliminary injunction be confirmed.

The defendant moves that the preliminary injunction be set aside to this extent, that the words "upon *one* film strip" be inserted after the word "which".

It alleges that it does not intend at present to attack the preliminary injunction in other respects, but that the wording is obscure. It might at first be supposed that it relates only to films 2361 on which tonefilms and picture films are contained together. However, according to the justification of its petition, the petitioner is also attacking films which the defendant is producing in Germany. These are, however, produced in this way, that the tone and the picture are always on separate film strips, not only in the recording, but also in the developing, copying, and unreeling. This process of production must not be forbidden by the preliminary injunction, particularly inasmuch as it was already disclosed by British Patent 105,589, of which a copy is pre-

2362 *Plaintiff's Exhibit No. 34.*

sented. The petitioner has also, it is alleged, given no satisfactory answer to the defendant's inquiry as to whether it derives rights from the preliminary injunction against tonefilms insofar as the tone and picture unreel from separate film strips. In view of this state of affairs, it is absolutely necessary to alter the wording of the preliminary injunction.

The petitioner argued against this.

For further details reference is made to the recited contents of the briefs and to the exhibits
2363 filed to establish credibility.

Grounds for the decision.

The defendant does not contest the existence of a reason for the injunction. As a matter of fact, there actually is a reason, since the tonefilm industry is just developing greatly and just at this time patent infringements might cause the petitioner incalculable harm.

The injunction claim likewise cannot be contested in itself. According to German Patent 368,383 it is highly advantageous to place the
2364 tone record and the picture series in talking films upon one common vehicle, one film strip. In this connection difficulties arise, however, inasmuch as in the recording the picture series may be overexposed or underexposed, while the series of tone signs is always normally exposed. These differences cannot be equalized in the developing. The inventor accordingly set himself the problem of abolishing these difficulties, and he solves this problem by this means, that the negatives are developed separately. In this process it is immaterial whether the exposure takes place separately or whether it is made on one

Plaintiff's Exhibit No. 34. 2365

film, which is separated for the developing. It is likewise immaterial whether the production of the unitary positive film is effected by copying the two negative films successively upon the same positive film or whether the two negative films are first pasted together and the copying is then done in one operation.

According to this, the range of protection of the patent extends to a process for the production of positive films which contain both picture series and tone record, in which process the 2366
negatives are developed separately. Nor does the state of the art controvert this interpretation, insofar as material has thus far been supplied by the defendant. British Patent 105,589 describes a process in which separate picture films and tone films are present both in the exposure and in the developing and copying. According to this patent, the unreeling of the films is as a rule also effected separately, with synchronous consociation. Solely on page 6, lines 30 to 32, is there a mention of the possibility of pasting the two positive films together at the 2367
overhanging edges, after the copying and before the unreeling, so that one film is actually present. Until the stage of the unreeling, at all events, this patent knows of no common film.

With this interpretation of the plaintiff's patent there exists no doubt that the process which, according to the article that has been presented, is employed by the General Electric Company falls under the plaintiff's patent, since in this process the films are, to be sure, exposed and developed separately, but are united in the copying, so that there are present, accordingly, positive films which contain picture series and tone

2368 *Plaintiff's Exhibit No. 34.*

records and in which negatives have been developed separately. This process clearly falls under the wording of patent claim 1, so that the prohibition of the preliminary injunction, which is in conformity with this claim, clearly describes the case of infringement.

The petitioner* believes that this wording is obscure, since it might also comprise processes in which the exposure, developing, copying, and unreeling are effected on separate films. We cannot assent to this view. The petitioner itself
2369 stated, at the oral hearing, that it does not regard such a process as falling under the patent. Nor would this be possible according to the state of the art in consequence of British Patent 105,589. But if one reads the text of the preliminary injunction without prejudice, such a process does not fall under it either, because according to the latter there is always a presupposition of positive films which contain picture series and photographically recorded tone record, *i. e.*, each film must contain both.

The petitioner bases its demand for correction
2370 of the tenor on the fact that the defendant has not given it a satisfactory reply to its inquiry. But the petitioner was altogether right in so doing, for in the inquiry of the defendant, which was read at the oral hearing, there is no description of the entire process of the defendant, but there was merely an inquiry as to whether separately unreeling films were comprised in the process. But the petitioner was unable to answer

*[Translator's Note.—Comparison with the statement of facts above will show that the terms "petitioner" and "defendant" have been erroneously interchanged in this paragraph and the first part of the following paragraph.]

this inquiry, since separate unreeling alone does not suffice to escape from the patent, if in an earlier stage of the process, say in the copying, a common film was present, which is separated for the unreeling. Insofar as the point of view of the art thus far can be surveyed, such a process would likewise fall under the patent of the petitioner. Consequently, as the matter stood, the petitioner was unable, prior to more detailed elucidation of the process, to give the defendant a satisfactory reply without the result that from 2372
this fact an obscurity of the preliminary injunction might be inferred.

Now of course the addition desired by the defendant could be included in the preliminary injunction, if it were suitable for increasing the clarity of the preliminary injunction and for precluding doubt in proceedings for compulsory execution. Such is, however, not the case. Precisely the wording desired by the defendant may lead to doubts. For if there is a mention of positive films which contain a tone film and a picture film on one film strip, then one might 2373
think of the unreeling film strip and consequently, in case of separate unreeling, assume without further ado that there is no violation of the preliminary injunction. As shown above, however, this is not unqualifiably the case. The wording desired by the defendant accordingly does not come into consideration. It likewise does not seem expedient to choose this version and to make definite assumptions by means of a further addition at the end of the formulation, since in that event the preliminary injunction would hardly be intelligible any more. The injunction as hitherto existing must therefore be allowed to stand.

2374 *Plaintiff's Exhibit No. 34.*

If the defendant further alleges that the preliminary injunction has already led to misleading newspaper reports, the wording of the preliminary injunction is, in the opinion of the court, not to blame for such misunderstanding. If one reads the preliminary injunction without prejudice, one can readily discover what it means.

The decision as to costs is based on Section 91 of the Code of Civil Procedure.

2375 (Signed) Dr. Hamburger, Kopf, Dr. Knapp.

Issued

Signature as
Document Clerk of the Office of
L.S. State (Superior) Court I.

Issued

Signature, Court Clerk,
as Document Clerk of the Office of
State (Superior) Court I.

2376 I hereby certify as notary that the foregoing transcript corresponds word for word with the copy of the decision of March 1, 1929, of State (Superior) Court I, Berlin.

Berlin, October 31, 1932
Dr. Jacoby

Notary
in the District of the State
(Superior) Court

(Seal)

Plaintiff's Exhibit No. 34. 2377

Dr. Gerhard Jacoby
Notary in the District of the
Prussian Supreme Court

Computation of Charges

Value 100,000 RM
Fee 550 of the Law Relating
to Court Cost, Sec. 1,
20 RM

Dr. Jacoby 2378
Notary.

The signature of the notary Dr. Gerhard Jacoby is authenticated. The notary is authorized to certify the document. The form conforms to German law.

Berlin-Charlottenburg, October 31, 1932

The President
of the Prussian (Superior) Court III
By authority: Quäbicker, 2379
(State) Superior Court, Director.
(Stamped seal)

The President of the
Prussian (Superior) Court III
Berlin

80 RM
In court fees have been paid
Langbehn
Judicial Inspector,
State (Superior) Court III.

2380 *Plaintiff's Exhibit No. 34.*

German Reich, City of Berlin,
Consulate General of the
United States of America. } ss.:

I, John F. Stone, Vice Consul of the United States of America at Berlin, Germany, duly commissioned and qualified, do hereby certify that Quäbicker whose true signature and official seal are, respectively, subscribed and affixed to the
2381 foregoing instrument, was at the time of subscribing the same an official of the Prussian Landgericht III at Berlin of the German Reich, duly commissioned and by law authorized to execute such acts, and that his signature and official seal affixed thereto are genuine, and as such are entitled to full faith and credit.

In Witness Whereof, I have hereunto set my hand and the seal of the Consulate General at Berlin, Germany, this 1st day of November, 1932.

2382 (Signed) John F. Stone
Vice Consul of the United States
of America

Service No. 06484
$2.—M 8.48

(Seal of the American Consulate
General, Berlin, Germany.)
($2.00 Fee Stamp)

PLAINTIFF'S EXHIBIT No. 35

A SYSTEM OF MOTION PICTURES WITH SOUND

H. B. MARVIN*

IT IS the purpose of this paper to present a brief sketch of a method of recording and reproducing sounds to accompany the action of motion pictures and to demonstrate one form of the results.

From the crude devices of thirty years ago have grown a highly developed art and a large industry relating to motion pictures. The combination of this art with a new one, that of simultaneous reproduction of sounds, requires for satisfaction a similar degree of development in the latter. Although perfection is not claimed yet, it is believed that the system to be described has improved the quality of the sound to the point where its use in combination with the older art results in improved entertainment.

The chief requirements of a good system combining sound and pictures are: first, synchronism between sound and picture; and second; distortionless recording and reproducing; that is, a high degree of faithfulness of sound both in loudness and quality.

Lack of synchronism may be caused by differences of speed of sound and picture either in the recording or reproducing process. Differences between original and reproduced sounds, called distortion, may be caused by mechanical, optical, photographic, electrical, or acoustical characteristics of the system.

Of the mechanical requirements for good reproduction, one of the most important is the ability of the machinery to move the film past the sound record aperture at uniform speed since pulsations in film speed due to non-uniform motion of gears, sprockets, etc., may result in bad reproduction. Weaving, curling, scratches, and dirt spots are other causes of mechanical distortion.

The effects of optical devices on the quality have been studied and a design obtained which is free from all except inherent limitations; namely, those arising from the fact that an infinitely narrow slit is not attainable.

Graininess of film has been minimized by the use of positive stock for the negative on which the sound is recorded. Errors due

* General Electric Co., Schenectady, New York.

to wrong exposure and development are small with this system because the results desired are constant density, minimum fog, and sharp edges. A density of 1.3 and development to unity gamma are aimed at, but these values are not critical. The uniformity of film speed during printing of the sound is as important as in the other processes, and no creeping or slipping is allowable.

Electrical distortion may be caused by failure of photo-electric devices to convert accurately the variations of light into electrical current; by failure of the amplifier to perform properly; and by lack of steadiness of the power supply.

The experience of the General Electric Company in the development of high quality loud-speakers has been utilized and it is believed that the present form represents the best obtainable at the present time. Reverberation in the room in which the sound is reproduced may, of course, affect the results and should be treated in each individual installation.

Another form of disturbance, while it is not properly called distortion, should be mentioned. This is the presence of extraneous noises, such as sprocket hum, mechanical vibration noises, radio interference, etc.

The major points in the problem of development of the system have been outlined. No attempt will be made here to discuss in detail the solution of the above problems. A fairly comprehensive knowledge of the characteristics of the process has been obtained in the laboratory and steady progress is being made toward the complete elimination of the faults. Thus the thirty years handicap confronting those who are working on the addition of sounds to the motion picture is being overcome.

The system which is to be demonstrated may be outlined as follows: pictures made with a standard camera driven at constant speed result in a picture negative of the same size as in the present art. The sound negative is photographed on a separate positive film moving in synchronism with the camera film. The two films are separately developed each to its own proper density, then combined in a printing machine to produce a combination print on a single film. The shape of the picture positive is maintained but the size is made slightly smaller to accommodate the sound record. The reproduction on the screen is of the standard shape, the sound record being masked in the projector. Dimensions of picture and sound record in the print are shown in Fig. 1. The problem of

synchronism has been solved by the use of synchronous motors both in recording and reproduction.

There are two types of sound records in use. One is known as "variable density—constant area" and the other as "constant density—variable area." A theoretical treatment of the two types has been given by A. C. Hardy[1] in a previous paper. In that paper it is shown that there are certain advantages in the variable area

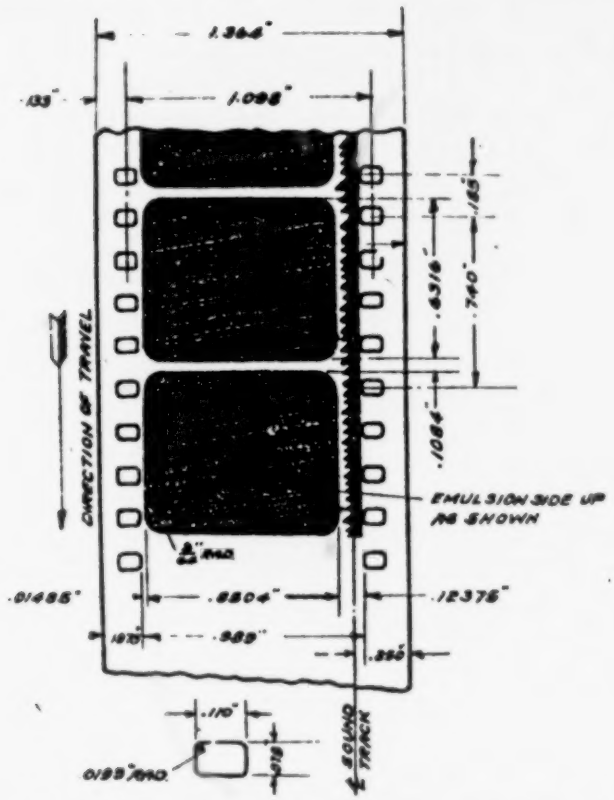

FIG. 1. Dimensions of film print bearing sound record

system which are likely to result in better reproduction with greater allowable deviations in exposure and development. This type of sound record is therefore used in our system. Examples are shown in Fig. 2 of sound records of pure tones, clarinet, French horn, and full orchestra. The recording and reproducing speed is 90 feet

[1] *The Rendering of Tone Values in the Photographic Recording of Sound*. Trans. S.M.P.E., *11* No. 31, 475 (1928).

per minute. The picture and sound are printed about 15 inches apart with the sound above the picture as seen in the projector. Sound is recorded through an optically imaged slit 0.001 inch by 0.100 inch and is reproduced by means of an optically imaged slit 0.001 inch by 0.110 inch, although narrower slits have been used.

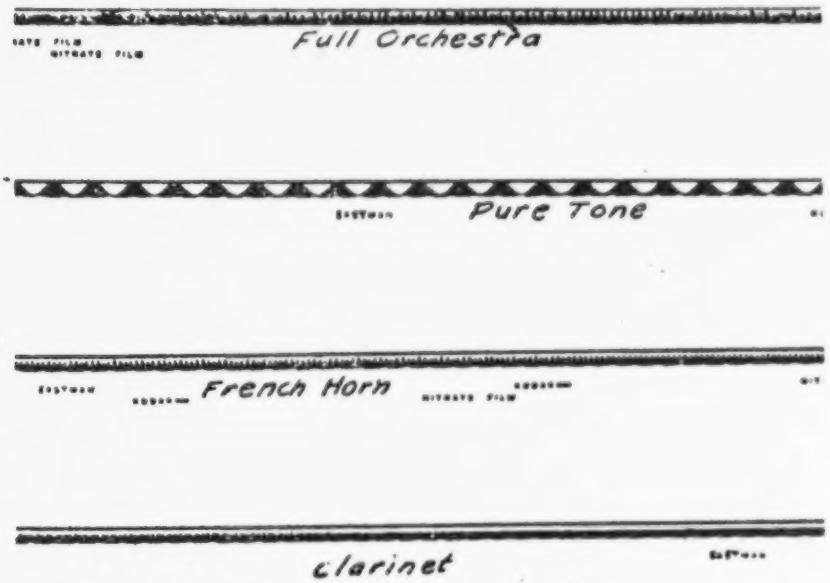

FIG. 2. Typical sound records.

Conversion from light pulsations to electrical current is accomplished by means of a gas-filled photo-electric cell having a caesium cathode. The reproducing light is obtained from a 50-watt, concentrated filament Mazda C lamp located on the projector. This light passing through the film, on which the blackened area is proportional to the sound, causes pulsations of current in the photo-electric cell. The alternating component of this current is then carried to the amplifier.

The power is amplified and controlled to the value necessary to operate the loud-speakers. The size of amplifier depends upon the class of service for which it is intended. The largest amplifier is capable of delivering 200 watts of undistorted power to the loud-speakers, which is believed to be sufficient for the largest theater.

The smallest size is intended to operate a single type 104 R.C.A. loud-speaker.

The loud-speakers are the moving cone type used in groups and assembled with baffles to increase the efficiency of sound radiation. The number of loud-speaker units ranges from one to twelve depending upon the size of installation. Each unit may be adjusted in horizontal or vertical directions so as to produce uniform distribution of sound throughout the theater. Power supply for the

FIG. 3. 200 watt amplifiers in duplicate.

amplifiers and for the fields of the loud-speakers is obtained from a motor generator set, the starting and adjustment being controlled at the amplifier. Amplifiers are supplied wholly or partly in duplicate for emergency operation. Two types of reproducers have been developed. One has an attachment for the Simplex projector inserted between the upper magazine and the projector head. A constant speed motor is substituted for the variable speed mechanism of the standard projector. The other is a complete projector in

which sound and picture mechanisms are contained within a single housing. Either of these arrangements may be run at constant speed for sound and picture or at variable speed for picture only.

The apparatus used in the recording process consists of camera, sound recorder, amplifier, sound collector, and the necessary power supply devices. Standard cameras are used except that a synchronous motor is substituted for the hand crank or the variable speed motor and a device is added to mark on the film the starting

FIG. 4. Loudspeaker group.

and stopping points. The sound recorder is substantially built to operate with little vibration and uniform speed. It is also driven by a synchronous motor. The film is carried over a drum with loops between the drum and sprockets. This has proved to be a desirable means of eliminating mechanical distortion caused by sprocket teeth and gears. A small photometer is used to check the exposure. The optical system is somewhat similar to that used in the reproducing device; namely, concentrated filament lamp and system of

lenses to produce an image of a slit on the film. The variation of exposed area on the film is obtained by means of an electromagnetic galvanometer similar to that used in oscillographs. The moving system comprising a current-carrying strip and a small mirror is so designed that the response is practically uniform from zero to

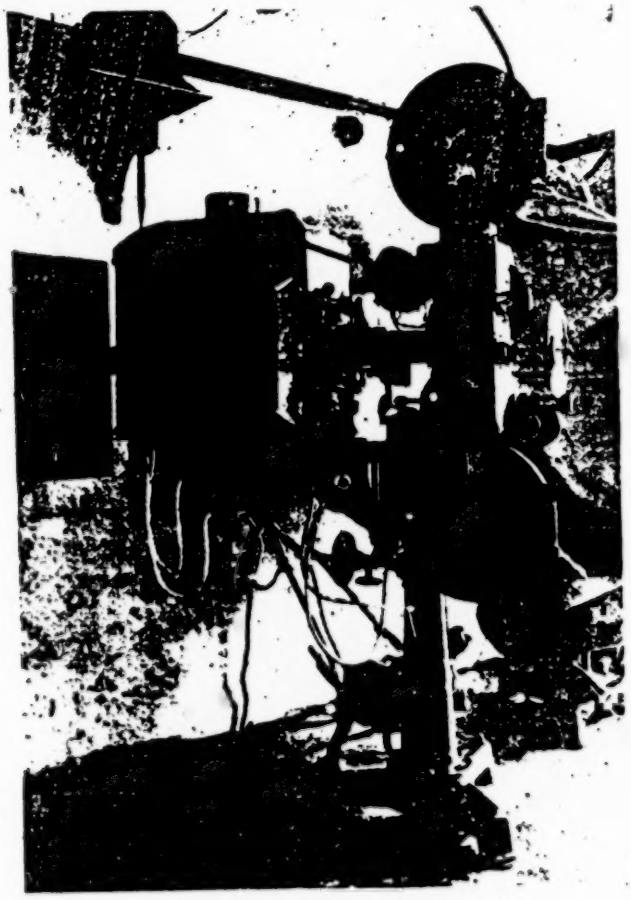

FIG. 5. Projector-reproducer

6000 cycles. This covers the useful range in speech and music. The sound collectors are of the type known as condenser microphones and may be used either singly or in groups. Each microphone is connected to its own two stage amplifier after which all are connected to a power amplifier adapted to control the volume of each collector separately and also the volume after combining.

The power amplifier may be located near the sound recorder and is equipped with a monitor loud-speaker. Power for the amplifier

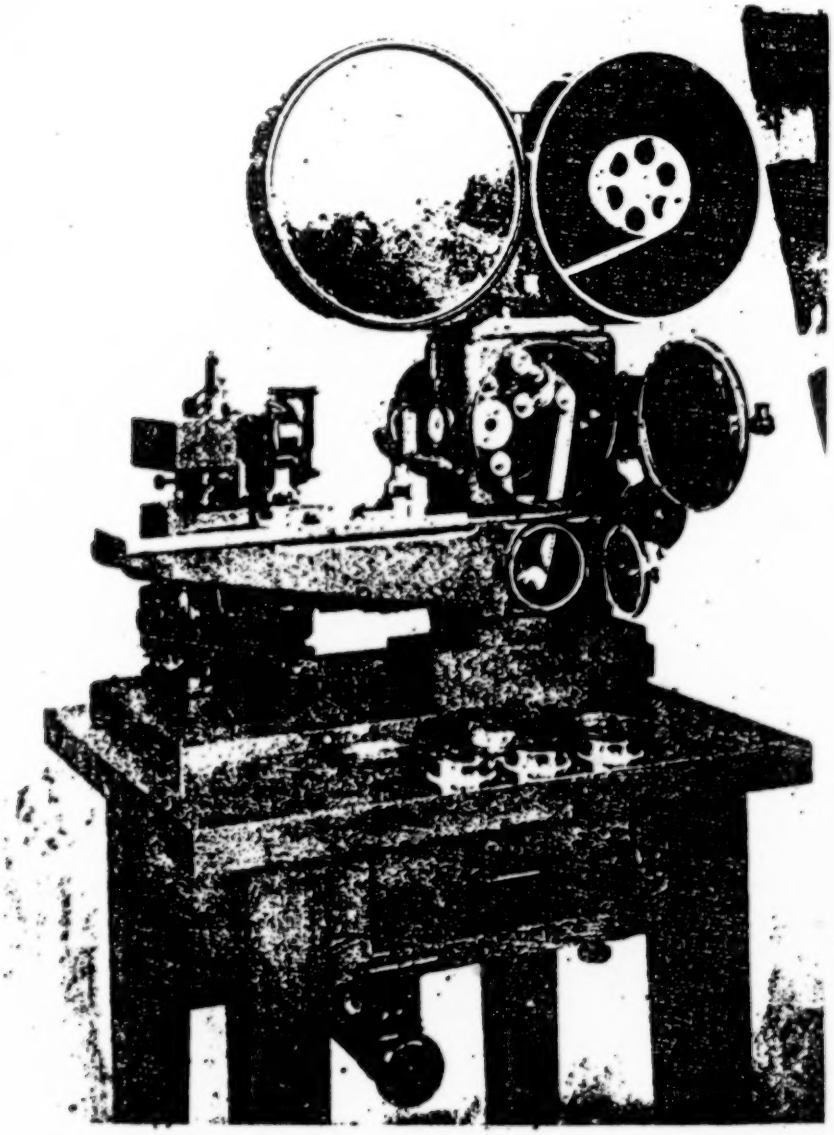

FIG. 6. Sound recorder.

and the recorder is supplied by a storage battery and a small motor generator set. Recorder and power amplifier are preferably located

in a separate room or in outside work on a truck. Only the sound collectors and the cameras need be at the scene of the picture.

The usefulness of the combination of sound and picture is beginning to be felt. One application is to record action and sound of scenes in which both originate and are recorded at the same time. The sound may be speech, music, or noises which are intended to enhance the effect of realism. In this field a new technique and a new art remain to be developed and it, therefore, excites the greatest interest in experimentally minded persons.

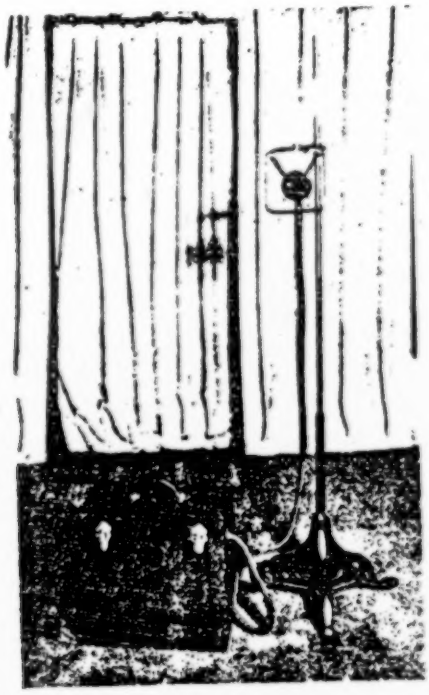

FIG. 7. Sound collector.

The reproduction of music to accompany a picture is a quite different field in which the sound recording may be done either at the time of the action or later. Both methods are feasible and each has its advantages. The method in which music is recorded after the final form of the picture has been decided upon seems on the whole to be preferable. The highest quality of reproduction is essential in this application, for its primary purpose is to provide better music in locations where the best is not already available.

This principle has been kept constantly in mind during the development of the present system.

A third application is the reproduction on film of stage sound effects where the primary object is accurate timing and dramatic effects, and the primary requirements are synchronism and adequate volume of sound

Examples of motion pictures with sound have been obtained in all three fields of application. The fidelity of reproduction can now be said to be fairly satisfactory; for example, speech has been recorded which is scarcely distinguishable from the original voice.

FIG. 8. Recording amplifier.

The same is true with instrumental music. Reproduction of explosive sounds has not yet reached the same degree of development. These are probably the hardest sounds to reproduce. It has been found feasible to transmit music and voice currents distances up to 200 miles over telephone lines and record with satisfactory results. The recording and reproduction of stage sound effects has proved practical as evidenced by the film *Wings*, although in this case the sound and picture prints are on separate films.

The demonstration which follows is an example of the recording of music to accompany a motion picture. The recording was done at a later time and in a different place from the photography. It

will be observed that in a few scenes there are opportunities for simultaneous recording of sound occurring during the action which leads to the conclusion that probably the combination of accompanying music with incidental sound effects will be desirable.

DISCUSSION

VOICE: Is the recording done on the film on which the picture is taken or on a separate film?

MR. MARVIN: The picture is taken on a separate negative, and the two are combined in the printer to form a combination print on the positive.

VOICE: If that is the case, do you use film wider than standard film?

MR. MARVIN: It is standard 35 mm. film, and to obtain the space for the sound track, we reduce the dimensions of the picture frame 14 per cent and use a shorter focus lens in the projector to get the normal size on the screen.

MR. WILLAT: Is it necessary to dupe the film to get the sound record?

MR. MARVIN: No, it is not; it is made direct from the negative.

MR. CRABTREE: How expensive an outfit would it require for 16 mm. film? Could a home radio apparatus be utilized for the amplification?

MR. MARVIN: Not having done it, I can't say, but I should say that probably in the same price range as other luxury devices we have.

MR. CRABTREE: Could we utilize our existing radio apparatus?

MR. MARVIN: A high quality set could be utilized without question.

VOICE: In some processes they use large horns with no air pocket. Is there any reason why the diaphragm type of speaker is used?

MR. MARVIN: The answer to that question involves a compromise. The horn type loud speaker is more efficient because it will give more sound per unit of power supplied. All horns have resonant frequencies, and with the cone type of loud speaker, this effect of of the horn is eliminated. One of these baffle members is a horn with 180° opening, and it is impossible to get horn resonance. We think we get better quality at the expense of more power required.

MR. CLARK: Is your projection print a print from a duplicate negative?

MR. MARVIN: The picture negative and sound record negative are fed simultaneously through a printer which prints the positive in one operation. The prints are, therefore, made from original negatives and not from dupes.

MR. RAGIN: Besides the difference in width of the sound track and the fact that the sound is recorded on a separate film, what differences are there between your method and the Movietone?

MR. MARVIN: Movietone has a variable density record, while ours is of the variable area type. The latter requires a sound track which has a high degree of contrast and that is all. We aim at an exposure which will give us a density of about 1.3 and develop to a gamma of 1, but these are not critical. The variable density system requires fairly close control of exposure and development in order to eliminate distortion due to the curvature of the H. & D. curve.

MR. CLARK: Could the two films be run in all apparatus?

MR. MARVIN: I haven't tried that, but I will say that during the course of development we worked with variable density films as well as variable area films, and both reproduce well. The only change necessary, I think, would be in the reproducing slit, which is a small metal piece which slides into the machine.

MR. WISSON: Does the technique of your system as you worked it out embrace such flexibility that you can go into the field for news reels?

MR. MARVIN: I have not been in the field myself on location, but I can say that the apparatus is sometimes built on a truck, and all the apparatus stays on the truck except the camera and sound collector.

VOICE: What effect do grease or scratches on the film have on the sound?

MR. MARVIN: That depends on the kind of grease or scratches. We can run a film between a thousand and fifteen hundred times before we prefer to have a new one. Grease uniformly distributed does no harm. Scratches parallel to the motion do no harm. Little digs in the film will cause a noise like that (demonstrating).

MR. CRABTREE: The film we saw was scratched in places, but I didn't notice any distortion of sound. The sound is on the same film, so we can assume that the record was scratched to the same extent as the picture area.

MR. WISSON: Does your apparatus embrace the use of a projector developed independently in your laboratory or plant, or can the device be attached to any standard projector?

MR. MARVIN: We have a projector built completely in the laboratory and have attachments for Simplex projectors.

MR. SPRUNCK: With duplicate negatives is the sound distorted?

MR. MARVIN: Any duplication process hurts quality to some extent.

MR. SPRUNCK: When printing the positive wouldn't it be possible to leave an unexposed area along the edge and have the sound negative printed on later?

MR. MARVIN: Yes, we have made many in that way.

MR. INGMAN: How do you judge the distance between your aperture and that to your sound record and still allow for the loop?

MR. MARVIN: That is obtained by synchronizing marks put on the picture negative and on the sound negative, which is done if both are recorded simultaneously. The picture you have seen was made weeks before the sound record. It is a case of making a mark on the picture film and synchronizing the sound with that. For the pistol records, they can be spliced in by observing the picture. Our sound aperture is about fifteen inches from the picture.

MR. GREEN: Regarding equipment for a theater, have you attachments for the various projectors?

MR. MARVIN: Yes, although the mechanical condition of most projectors in the booths is not quite good enough to insure good reproduction. Imperfections in gears don't affect the picture but sometimes do affect the sound.

MR. GREEN: Would your attachment allow me to use the apparatus and then the regular pictures without sound?

MR. MARVIN: Yes.

MR. GREEN: Is a separate generator also necessary?

MR. MARVIN: You must have a source of power for the amplifier, which may be a rectifier or generator set. We prefer the latter.

MR. GREEN: Is any other apparatus necessary besides those and your stage amplifiers or horns?

MR. MARVIN: The projector must be driven at constant speed.

MR. GREEN: That is understood.

MR. PHYSIOC: Do you make all the prints from your records by projection?

MR. MARVIN: No, some are made by contact; some, by projection.

MR. PHYSIOC: Is there any improvement in tone by direct contact printing as opposed to projection printing.

MR. MARVIN: As far as we have been able to judge, equally good results for the sound may be obtained by either method.

MR. PHYSIOC: Can you get sound reproduction from the negative-records?

MR. MARVIN: Yes. The negative run in the projector must run with the emulsion side away from the light and requires a slight change of focus.

MR. DEVAULT: What is the function of the baffle board and why the multiplicity of speakers?

MR. MARVIN: The function of the baffle board is to increase the sound radiation at low frequencies. The baffle board or other device should have dimensions comparable with the wave-length of the sound.

MR. DEVAULT: Do you mean low tones?

MR. MARVIN: Yes. The second question I can answer this way: In a theater, the elevation and the floor plan require distribution of the sound energy through large angles, and in order to accomplish even distribution, we use multiple units and direct them.

MR. SPRUNCK: Does a heavy print give a better quality than a thin print?

MR. MARVIN: It gives more volume than a thin print.

MR. GORDON: With your particular photo-electric cells, what is the color sensitivity across the spectrum?

MR. MARVIN: A caesium cell is used. I assume your question bears on the use of tinted film?

MR. GORDON: Not necessarily.

MR. MARVIN: Experiments have shown that the tinted films of the lighter shades—amber, green, yellow, lavender, pink—have a negligible effect on the volume but none on the quality. Deeper dyed films may be compensated for by the amount of amplification used.

MR. GORDON: Is it more sensitive to the red or the blue?

MR. MARVIN: It is more sensitive to the blue.

MR. WISSON: I understand that DeForest and Movietone have the sound on the right-hand side and below the projection aperture.

MR. MARVIN: The sound track is on the right-hand side, on the same side as in the Movietone. The sound precedes the picture in the projector exhibited.

MR. CRABTREE: Were the speakers being operated at the maximum capacity or the minimum?

MR. MARVIN: Nearly minimum.

MR. CRABTREE: How many times louder could you make the music and still have it undistorted?

MR. MARVIN: About sixfold.

MR. NYE: With reference to the illusion in the case of speaking pictures regarding the fact that sometimes the character and the sound do not appear to have the same location, how is it affected by the distance of your pick-up apparatus and the camera and the fact that you have a multiplicity of loud speakers instead of a single one?

MR. MARVIN: That is a difficult question. I think the most important feature necessary for the illusion is absolute synchronism. A displacement which is too small to be analyzed visually as a time lag does have the effect of separating the voice from the figure. A multiplicity of loud speakers apparently has no effect.

MR. PHYSIOC: Do you adopt a projection system of printing merely to maintain the proportions of the picture?

MR. MARVIN: That was the principal reason.

MR. PHYSIOC: You can take my vote to destroy the proportions and maintain photographic quality if the suggestion is any good to you.

MR. CRABTREE: As far as tone reproduction goes, it is possible to get just as good results by optical printing as by contact.

MR. GREEN: What happens to the sound continuity when you have sprocket hole tears or the film is damaged and one or two frames are cut out? What would happen in the case of the overlap when cementing two frames together?

MR. MARVIN: At least ten splices were made in the picture you saw tonight. Does that answer your question?

MR. GREEN: Yes. In the dialogue, if two or three frames were cut out, what would happen?

MR. MARVIN: Only a fraction of a syllable would be lost. I think the effect is more pronounced on music than speech because the rhythm is slightly interrupted by a cut.

MR. GRIFFITH: I assume that the volume of sound for a given setting of the reproducing system depends upon the amount of light going through the sound record, as that determines the amount of light affecting the cell. Therefore when you make a light or dark print the only thing affected is the volume, as long as the edge of the sound record is sharp.

MR. MARVIN: Unless exposure is carried to the point of fog. The first effect is to fill up the valleys of the finest vibrations. The effect on the ear is as though the higher pitched tones were unduly suppressed. The slit is about one mil in width, so that some high pitches cannot be recorded faithfully. The upper tones of a violin may reach as high as 2,000 cycles. We have records containing 10,000. The effect of the slit width is to reproduce the highest tones at a relatively lower volume than the lowest tones. That begins to take effect at about 2,000 cycles, and very slowly at first. That effect can be compensated to a large degree in the amplifier, but the ideal would be a slit considerably narrower than 1 mil. We have made records at 0.2 mil slit width. The only expense is the amount of light necessary. As the slit is decreased, the amplification of light must be increased.

MR. GRIFFITH: Those sound records which can conveniently be made separately from the picture, as in pistol shots, are the easiest form of application. The application which seems to me to have the greatest possiblities is dialogue. Have you worked on that?

MR. MARVIN: Yes.

MR. GRIFFITH: Does it seem difficult to get a perfect illusion; for instance, of people talking together in a room? It would seem to me that any position of the speakers other than behind the screen would destroy the illusion.

MR. MARVIN: It has not so far. I think it is because we are so used to watching the lips of speakers on the screen that we unconsciously will do the listening by assuming that it comes from the lips. If exact synchronism is obtained, the illusion is very good.

MR. GRIFFITH: Do you feel that it is essential to continue to make the sound records separately, or do you feel that the technique will be developed so that the sound and the picture can be recorded on the same negative at the same time? Do you think this desirable or difficult?

MR. MARVIN: We believe that the sound record can be made better on a separate film partly because it removes the sound recording from apparatus which must have intermittent motion. Then, it also allows the sound recording to be done in a separate room or booth in which the sound can be monitored so that the recorder can judge the quality before and during recording.

MR. BIRD: Do you use positive film in order to eliminate grain?

MR. MARVIN: Yes.

MR. BIRD: With regard to scratches and oil on the sound track: What are the effects of after-treatment, such as waxing and varnishing?

MR. MARVIN: We have often waxed film but have not tried varnishing.

MR. CRABTREE: The application of a coating of wax over the entire surface has no apparent effect.

MR. BIRD: I am referring to circulars I have had from a concern who process films for the purpose of prolonging their life and I understand that it is a chemical put on the emulsion before the prints are sent out. It is not a waxing process but a coating on the surface of the print.

MR. CUFFE: I think this is a varnish process, which is not used to any extent as yet. I don't see how it would affect the sound at all.

MR. MARVIN: In general, any transparent substance on the film will not affect sound any differently from the picture.

MR. CRABTREE: I think the answer to this question is contained in a previous paper of mine. The film is treated with formalin vapors or by the application of a Bakelite or cellulose nitrate varnish. Provided that the applications are uniform, they will not affect the sound.

MR. CLARK: In recording dialogue in a picture, how would you take care of a lap dissolve?

MR. MARVIN: Would you have speech going on during the dissolve?

MR. CLARK: Yes; one action fading out with speaking and a new one coming in, where you had the voices mixed together.

MR. MARVIN: I wouldn't do it that way.

MR. CUFFE: They don't use lap dissolves at all in the Movietone. It would be only a conglomeration of noises when the two were superimposed.

PLAINTIFF'S EXHIBIT No. 36

105,589

PATENT SPECIFICATION

Application Date, Apr. 13, 1916. No. 5448 16.
Complete Accepted, Apr. 13, 1917.

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COMPLETE SPECIFICATION.

Talking Picture Apparatus.

I, HENRY CHARLES BULLIS, Electrical Engineer, of Redwood Falls, Minnesota, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to an improved apparatus for simultaneously taking and reproducing picture and sound records, thereby producing what are commonly termed "talking pictures." The present invention consists essentially in the provision of a means whereby the picture record and sound record can be given the necessary individual treatment for developing them in the most effective manner and then readily assembled in such a manner as to bring the picture record and sound record in proper position to produce perfect synchronism when the pictures and sound are reproduced.

Further, the provision of a means which admits of different emulsions and different treatments being employed in making the picture record and sound record, which provides corresponding indentification marks upon the picture record and sound record so that there will be no difficulty in assembling the two records in the proper relation for the reproducing operation, which admits of the picture record and sound record being handled separately while being developed and subsequently joined together so as to produce a single film if such is desired, and which provides for reproducing the sound from a continuously moving portion of the film and the reproduction of the picture by an intermittently moving portion of the film.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:—

Figure 1 is a diagrammatic view of a form of apparatus suitable for simultaneously making the picture and sound records, the casing being shown in section.

Figure 2 is a vertical sectional view on the line 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 is a detail view of the microphone controlled source of light which is used for making a photographic sound record upon the emulsion of the sound record film.

Figure 4 is an enlarged horizontal sectional view through the lens and a portion of the casing which is used in connection with the microphone controlled source of light to make the sound record upon the film.

Figure 5 is a vertical sectional view through the same on the line 5—5 of Figure 4.

Figure 6 is a transverse sectional view on the line 6—6 of Figure 4.

Figure 7 is a detail view of one of the cog wheels which is employed for moving the films through the record making apparatus.

Figure 8 is a diagrammatic view similar to Fig. 6, showing the reproduction apparatus.

Figure 9 is a sectional view on the line 9—9 of Figure 8, showing the manner of assembling the two films in the reproducing apparatus.

Figure 10 is a detail view of one of the toothed wheels used in the reproducing apparatus.

Figure 11 is a detail view of portions of the picture film and sound film, together with a corresponding portion of the identification mark, printing film which is employed in connection with the two films when making the records.

Corresponding and like parts are referred to in the following description and indicated in all of the views of the drawings by the same reference characters.

In carrying out the present invention the picture record and sound record are made at the same time and by the same apparatus, but upon separate and distinct films. It has been previously proposed in this art to accomplish the result by making the picture record and the sound record upon the same film, although this is open to the objection that the proper emulsion, manipulation and development for obtaining the best results in the sound reproduction differ very materially from those required to obtain the best results for the picture records. Where the two records are made upon the same film, using the same emulsion, it must be obvious that a proper treatment or development of one record can only be obtained at the sacrifice of the other record, since the special form of development required to get the best results from the two records would ordinarily be quite different. It will thus be seen that there are very important practical reasons why the two records can not be successfully and satisfactorily made upon the same film, as has been previously proposed, and it is the object of the present invention to overcome this particular objection by providing a construction which admits of the records being made upon different films, which may have different emulsions, and may be individually treated in the development exactly as may be required to produce the best results. These two independent films have corresponding identification marks made upon the same at the time the two records are made, so that they can be assembled without difficulty in the proper manner necessary for a synchronous reproduction of the pictures and sounds.

Figure 1 illustrates in a diagrammatic manner a form of apparatus adapted to be employed in making the picture and sound records. The numeral 1 designates the casing which is provided at the top thereof with a chamber 1^a within which are mounted the reel 2 from which the sensitized films are unwound, and the reel 3 from which the opaque printing film is unwound, a similar chamber 1^b being provided at the bottom of the casing within which are mounted the reel 4 upon which the exposed films are wound and the reel 5 upon which the opaque printing film is wound. Suitable guide means 6 are provided at the top and bottom and intermediate points of the main portion of the casing 1 for holding the films and printing strip together during the record making operation. The numeral 7 designates the usual continuously rotating toothed roller and the numeral 8 the usual intermittently rotating toothed roller, the loop between the two rollers being indicated at 9. The conventional mechanism may be employed for operating these rollers and the picture taking mechanism, the portions of the films below the toothed roller 8 having an intermittent movement, while the portions of the films above the rollers 7 have a continuous movement.

The picture film 10 and sound film 11 are made separate and distinct from each other, and may be treated with the same emulsion, or with different emulsions, as found necessary to obtain the best results. The toothed rollers 7 and 8, one of which is shown in detail by Figure 7, are each provided with four peripheral rows of teeth 12. The picture film 10 engages one pair of rows of the teeth 12, while the sound film 11 engages the opposite pair of rows of

teeth 12, the two films being thus locked together and moved simultaneously through the machine. The printing strip 13 is arranged intermediate of the picture film 10 and sound film 11 and overlaps the adjacent inner edges of the two films, said printing strip being suitably perforated to engage the two inner rows of teeth 12 on the toothed rollers 7 and 8. This printing strip 13 is formed of opaque material, being provided at the edges thereof with transparencies 13ª in the form of identification marks. In the present instance numerals are employed, although any other suitable form of character might be substituted. These transparencies 13ª in the edges of the opaque strip 13 will, as hereinafter described, print corresponding identification marks 10ª and 11ª upon the picture film 10 and sound film 11, respectively. Inasmuch as the sound record must be made upon the continuously moving film above the loop 9, and the picture record upon the intermittently moving film below the loop 9, there will necessarily be a space between the corresponding transparencies 13ª on the opposite edges of the printing strip 13 in order that the portion of the sound record on the film 11 opposite an identification character 11ª may correspond to the picture opposite the same identification character 10ª on the picture strip. With the ordinary forms of moving picture machines, this interval would be ten spaces, so that similar transparencies 13ª on opposite sides of the printing strip 13 would be just ten spaces apart. Where numerals are employed, as in the present instance, there is a difference of ten units between those numerals directly opposed to each other on the printing strip, the numeral "7" being directly opposite the numeral "17", the numeral "8" directly opposite the numeral "18", *etc.*

The pictures are made in the usual manner through an aperture 14, a conventional form of lens 15ª being shown as arranged in front thereof. Immediately above the aperture 14 is an aperture 15 arranged over the edge of the printing strip 13 and formed in one end of a suitable housing 16. The rays from a lamp 17 arranged within the housing are focused by a lens 18 upon the edge portion of the printing strip 13 which moves opposite the aperture 15. The various transparencies 13ª upon that side of the printing strip 13 which overlaps the edge of the picture film 10 are thus successively printed upon the edge of the picture film as the pictures are taken and the film advanced.

At a point above the loop 9 the sound film 11 moves across an aperture 20 in one end of a housing 21. This aperture 20 is in the form of a transverse slit (see Figs. 4, 5 and 6) and a laterally elongated lens 22 is arranged within the housing to focus the rays from a sound controlled source of light 23 through the slit 20 upon the sound film 11. The shape of the lens 22 is such as to focus the light rays in a transverse line, instead of in a point, although the slotted aperture 20 is essential to prevent what is termed halation. The intensity of the light rays from the source of light 23, varies with the sound, so that as the sensitized film 11 is moved past the aperture 20 the intensity of the light acting thereon will be continually changing, the variance in intensity being controlled by the sound which is to be reproduced. This result may be produced in different manners, although I have shown the source of light 23 as in the form of an incandescent bulb having a long filament 23ª Figure 3 arranged parallel to the slit 20. The circuit 24 for the lamp 23 includes a source of electrical supply 25 and one coil 26 of an electro-magnetic coupler. Surrounding the coil 26 is another coil 27 Figure 3, arranged in the circuit 28 of a microphone or series of microphones 29, a suitable source of energy 30 being also arranged in the said circuit. In Figure 1, a series of the microphones 29, are shown as arranged in parallel and mounted at the back of the stage, the possible position of different actors in front of the microphone being indicated by the small circles 31. The sound waves will act through the microphone circuit 28, and owing to the relation of the coils 26 and 27 the intensity of the current in the light circuit 24 will be caused to fluctuate by induction.

Referring again to Figure 3 in the drawings, it will be seen how the force of the current flowing in the circuit 24, 28, 29, and 26 becomes superimposed upon the force of the current flowing in circuit 25, 24, 26 and 26 to oppose or assist the latter in its heating and illuminating of the filament 27.

Taking an induction coil in which the two independent circuits are wound about a common core as shown in the drawings, and where the current flowing in circuit 27, 28, 29 and 30 creates a constant number of lines of force under normal conditions, then any change in the number of these lines of force will induce a current in the circuit 24, 24, 25 and 26 according to the rule as laid down by Prof. S. P. Thompson, namely:—"A decrease in the lines of force, which pass through a circuit, produces in another circuit, enclosing the same lines of force, a current flowing in a positive direction (*i.e.* produces a direct current); while an increase in the number of lines of force which pass through the circuit produces (in the other circuit) a current in a negative direction."

Now, then, the alternate increase and decrease of current, as a result of sound acting upon the microphone, will increase and decrease alternately the number of lines of force flowing through both coils or circuits 24 and 27 and hence create in the circuit 26 an impulse of current that will assist or oppose the illuminating force of current from source 25 according as the current in 28 is an increasing or decreasing one, the current of 25 being in one direction. So long as there is no change in the current flowing in 28, which is the case when no sounds are acting upon the microphone, then the current in circuit 24, 26 and hence the illumination of the filament will be constant, the result of current from 25. Likewise the image photographed upon the moving film will be of uniform density

It is evident then that at any instant (for example when the current from the microphone is increasing) we may at will so arrange the direction of flow of the current from 25 that the current induced by it will assist or oppose it, and hence increase or decrease the illumination of the lamp at this particular instant and part of the sound wave.

That this particular point in the photo record must be, for reproduction by the selenium cell method, just the reverse in degree of transparency from what it should be if used for reproduction by the magnetic film method set forth in the Application No. 5447 of even date, should be apparent, if we consider that more light must strike the selenium cell to cause more current to act upon the receivers, while in the other case more lines of force must pass through the magnet coils and hence more iron be present to produce the same increase of current as results from transparency in the other case.

Inasmuch as the films used in reproducing must be a copy of the original which would result in what is known as a reversed or positive copy, it becomes necessary for us to have the density of the recorded images in the original film just opposite to what we require for reproduction, hence it will be seen that the original film for use in magnetic film reproduction might be used direct with a solenium cell to get what we would get with the iron copy in the other method.

As to the character of the sound waves, they are recorded in a manner distinctive of each characteristic. The higher the pitch, the larger the number of transverse lines representing the sound waves will be photographed per unit length of the film, The lower the pitch, the less will be this number of lines.

The more volume there is to the sound the more opaque will be the lines, owing to the higher intensity to which the sounds impinge upon the microphone, the consequent increase of pressure upon the carbon granules, the higher point to which in consequence the current is increased and the higher point to which the illuminating power of the filament will be raised. This will be the case where the record is to be used as a negative master record

from which copies are to be made for reproduction with a selenium cell. If, however, the copies are to be used for reproduction by the magnetic film method, then the pitch will be recorded in the same way by the number of lines per linear unit, but the volume will be represented by the extent to which the lines vary in transparency,—the more volume the more transparent, whereas in the other case the more opaque. That such is the case is likewise shown in the familiar experiment in which a manometric flame is made to vibrate by sound striking upon a diaphragm, and viewing the results as reflected by a revolving mirror. Here also it is found that the number of vibrations vary with the pitch, and the height of the flame with the volume of sounds.

Arranged immediately above the housing 21 is a housing 32 having an aperture 33 in one end thereof and provided with a lens 34 and light 35. The rays from the light 35 are focused by the lens 34 through the aperture 33 upon that side of the printing strip 13 which overlaps the edge of the sound film 11. As the films are advanced the transparencies 15' of that side of the printing strip are brought successively opposite the aperture 33 so that the characters will be printed upon the edge of the sound film 11. It will be observed that the two printing apertures 15 and 33, respectively, are arranged just one step in advance of the picture taking aperture 14 and the sound record aperture 20, respectively, so that the identification characters are really printed upon the edges of the films before the picture record and sound record, although the relationship between the two films is maintained, so that the result is the same as though the identification characters were printed at the same time the records were made.

The exposed films 10 and 11 are developed separately, and each film may be manipulated and treated in the manner necessary to perfect the same to the best advantage, the identification marks printed through the transparencies in the edges of the opaque printing strip 13 appearing at intervals along the edges of the films, thereby enabling the two films to be subsequently reassembled without difficulty in the proper relation necessary to bring about a synchronous reproduction of the pictures and sounds. The pictures appear upon the picture film in the usual and well known manner, while the sound record appears in the form of a series of transverse striations of varying intensity. The result is a film with a ladder-like strip of alternately dark and light zones merging into each other, as determined by the sound waves. From the original negatives positives for reproduction may be obtained in the usual manner by contact printing or otherwise.

One possible form of reproducing apparatus is shown by Figure 8. The main casing 36 is provided at the top thereof with a chamber 36^a to receive the reel 37 from which the films are unwound, and at the bottom thereof with a chamber 36^b to receive the reel 38 upon which the films are wound. The toothed roller 39 engages the films and rotates continuously, while the toothed roller 40 which is arranged below the roller 39 has an intermittent movement, said rollers being actuated by the usual mechanism. One of these rollers is shown in detail by Figure 10, and it will be observed that they have three peripheral rows of teeth 41. For reproducing purposes there is no occasion to use the printing strip 13, and the inner edges of the picture film 10 and sound film 11 are overlapped and caused to engage the intermediate row of teeth 41. At a point above the continuously rotating toothed roller 39 the sound film 11 is moved across a slit or aperture 42 through which rays of light from a lamp 43 are focused upon the film by suitable lenses 44. The light acts through the sound film 11 upon a selenium cell 43^1, or some similar member arranged in the circuit 44 of a telephone receiver 45, a source of electrical energy 46 being arranged in the circuit. The striations upon the developed sound film 11 are of various degrees of density, so that the intensity of the light acting upon the selenium cell 43^1 will vary inversely as the density of the sound record striations, the light acting strongly upon the selenium cell when

a comparatively transparent striation is brought opposite the slit 42, and acting very weakly upon the selenium cell when a denser striation is brought opposite the slit. The resistance of the selenium cell, as is well known, varies with the intensity of the light acting thereon, so that the current in the telephone receiver circuit will be caused to fluctuate, these fluctuations being determined by the sound record, with the result that the original sound is reproduced.

Below the continuously rotating toothed roller 39 the films move intermittently and the picture film 10 is moved across an aperture 47, the pictures being projected upon a screen 48 by rays from a suitable source of light 49 which are preferably focused by the lens 50 and 51. Suitable guide members 52 may be provided for cooperation with the rollers 39 and 40 to carry the films through the machine in the proper manner, and the mechanism for moving the films and projecting the pictures may be of the conventional construction.

After the films have been properly developed, and positives then produced from the negatives by contact printing or otherwise, the picture film 10 and sound film 11 are brought together and assembled for the reproducing apparatus. The corresponding identification characters 10^a and 11^a on the respective films indicate corresponding portions of the picture record and sound record, so that there is no difficulty in arranging the films for a synchronous reproduction of the pictures and sounds. The sound must be reproduced from the continuously moving film, while the pictures are reproduced from the intermittently moving film, so that the portion of the sound record corresponding to any particular picture must be several steps behind the picture as the film passes through the machine. Ordinarily, ten spaces would be about the proper amount, so that in assembling the two films the numeral "7" on the sound film would overlap the numeral "17" on the picture film, *etc.* This relation, however, can be varied, as may be required to bring about a synchronous reproduction of the sounds and pictures. The picture film 10 and sound film 11 may either be kept separate and distinct from each other, or the overlapping edges thereof may be cemented together so as to produce in effect a single film.

The sound record is made simultaneously with the picture record, and this may be accomplished either by photographic means, as in the present instance, or by any other suitable means, although the two records are made upon separate films or strips so that they are susceptible of having the necessary individual treatment necessary to the best results. When the sound record is made photographically, the arrangement is such that the sound controlled lamp is caused to give a larger variation of light for the louder sounds than for the weaker sounds. The sound record employed for reproducing purposes is made by contact printing from the master sound record film, and it will accordingly be obvious that in the reproducing sound record also the loud sounds are represented by striations having considerable variation in intensity, while the weak sounds are indicated by striations with smaller variation. The light thrown upon the selenium cell thus varies considerably for a strong sound, and varies less for a weak sound.

Any effect of the sound waves that causes a reduction of resistance in the lamp circuit is photographed and hence causes the image to increase in density. In other words, the density of the image upon the negative record varies directly as the pressure of the sound waves upon the microphone and inversely as the resistance of the microphone, which conditions can only be met by having the resistance of the microphone vary inversely as the current flowing in the lamp from whose light the image is impressed. The result is that as the sound waves alternately increase and decrease the pressure upon the microphone, there is an increase and decrease in the illuminating power of the lamp and the resulting record is a photographic image increasing and decreasing in intensity as the sound waves increase and decrease their effect upon the micro-

phone. In other words, this photographic record is not a succession of dark and light lines sharply defined but each sound wave is represented by a gradual rise and fall in intensity, blending together in one continuous whole. The extent of the rise and fall in intensity is directly proportional to the loudness of the sounds. In the reproducing record, printed from this negative, the same conditions will hold.

It is evident that to get a true reproduction we must have the resistance of the selenium cell vary exactly as the resistance of the microphone varies. The resultant effect upon the loud speaking 'phone will then be the same as it would be if the current came directly from the microphone.

This sound record, made upon a separate strip by photographic or other suitable means, bears identification characters produced upon the picture record, so that after the two records have been completed by the special individual handling or treatment necessary to the best results for each record, they may be assembled to produce a synchronous reproduction of the pictures and sounds.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Talking picture apparatus including means for simultaneously making separate and independent adjustably related sound and picture records, in combination with means for simultaneously marking said separate records at all points throughout their length with a series of corresponding identification marks, to facilitate assembly for a synchronous reproduction.

2. In talking picture apparatus as claimed by Claim 1, means arranged between said records for placing a series of corresponding identification marks on the adjacent marginal edges of the two records throughout their length whereby said records may be matched at any and all points to facilitate assembly for a synchronous reproduction.

3. In talking picture apparatus as claimed by Claim 1, a marking element having separate oppositely located series of corresponding identification marks and means for simultaneously printing corresponding identification marks upon the two records to facilitate assembly for a synchronous reproduction.

4. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, means for making a picture record upon one of the films and a sound record upon the other film, and a printing member movable with the films and serving to place a series of corresponding identification marks upon the films to facilitate assembly for a synchronous reproduction.

5. In a talking picture apparatus as claimed by Claim 4, a printing strip movable with the films and overlapping the edges thereof.

6. Talking picture apparatus including a casing, means including toothed wheels for simultaneously moving two independent films through the casing, means for simultaneously making a picture record upon one of the films and a sound record upon the other film, an opaque printing strip overlapping the two films, perforations in said opaque printing strip for engagement with the beforementioned toothed rollers to move said strip through the casing with the films, the edges of the opaque printing strip overlapping the edges of the films and being provided with corresponding transparent identification marks, independent apertures under which the transparent marks upon the edges of the opaque printing strip are movable, and means for projecting light through the apertures to print the identification marks upon the edges of the films.

7. Talking picture apparatus including a casing, mechanism for moving two independent films through the casing, a portion of the movement being continuous while another portion thereof is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for simultaneously making a sound record upon the continuously moving

portion of the other film, and means for simultaneously placing corresponding identification marks upon the continuously moving portion of one film and the intermittently moving portion of the other film so that corresponding portions of the picture and sound records can be readily identified.

8. In a talking picture apparatus as claimed in Claim 7, an opaque printing strip movable through the casing with the films and overlapping the same, said printing strip serving to place corresponding identification characters upon the two films so that corresponding portions of the sound record and picture record can be readily identified.

9. In a talking picture apparatus as claimed in Claim 8, providing the overlapping portions of the opaque printing strip with corresponding series of transparent identification characters, and means for projecting light upon the transparent identification characters for causing the same to be printed upon the films as the films and strip are moved through the casing.

10. In a talking picture apparatus as claimed by Claims 7, 8 and 9, arranging the corresponding characters of the two series at such an interval that one of them will be over the continuously moving film upon which the sound record is made while the other one is over the intermittently moving film upon which the picture record is made.

11. Talking picture apparatus including a casing, means for simultaneously moving two independent sensitized films through the casing a portion of the movement being intermittent while another portion of the movement is continuous, means for making a picture record upon the intermittently moving portion of one of the films, a slitted aperture being arranged opposite the continuously moving portion of the other film, a sound controlled light, means for focusing the rays from the light through the slitted aperture, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with two series of corresponding transparent identification characters, and means for projecting light upon the printing strip for causing the transparent characters to be printed upon the two films

12. In a talking picture apparatus as claimed by Claim 11, a lens for focusing light through the aperture, an electric lamp for the lens, a circuit for the light, a microphone, a circuit for the microphone, the two circuits having an electro-magnetic coupling so that the intensity of the light is controlled by the sound.

Dated the 13th day of April, 1916.

KINGS PATENT AGENCY LIMITED,
By BENJ. T. KING,
Director,
Registered Patent Agent.
165, Queen Victoria Street, London, E.C.,
Agents for Applicant.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

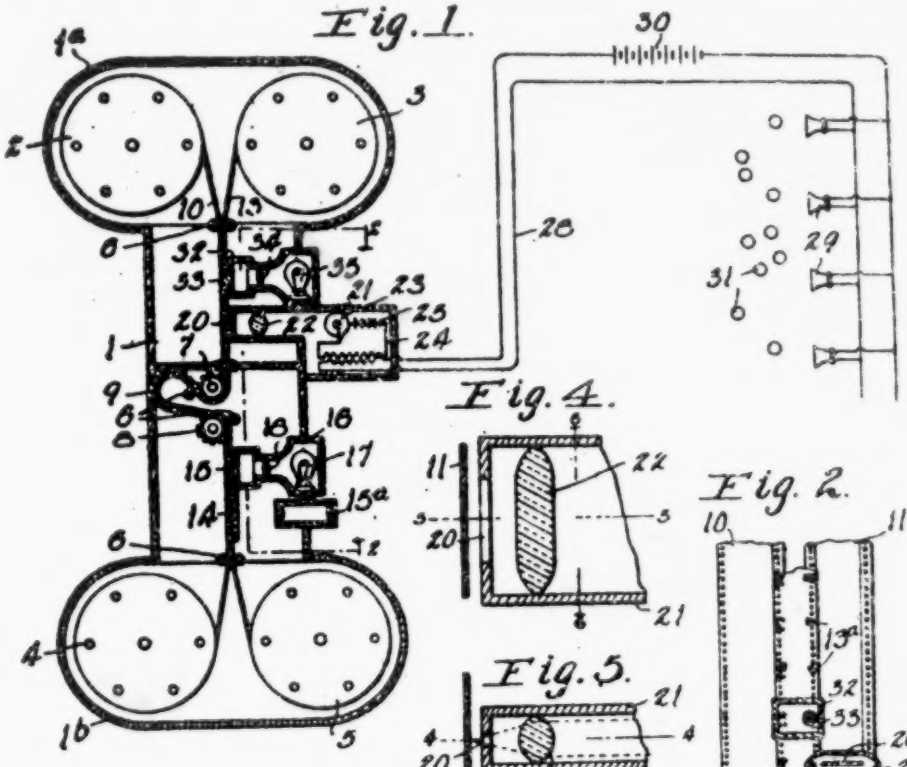


Fig. 4.

Fig. 2.

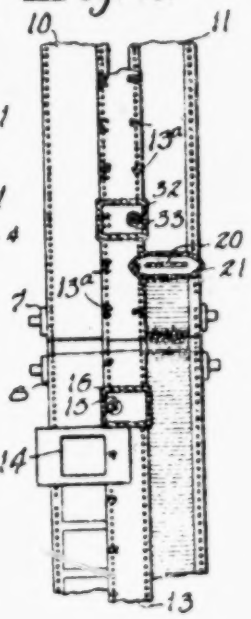


Fig. 5.

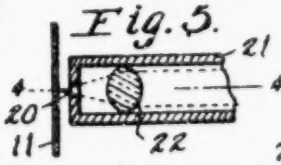


Fig. 3.

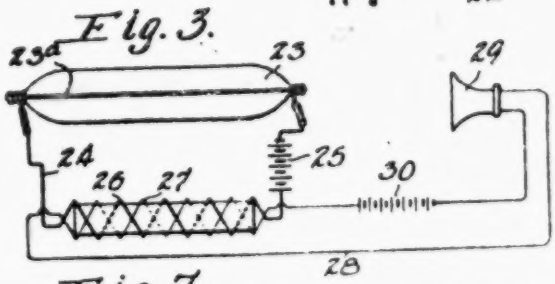


Fig. 7.

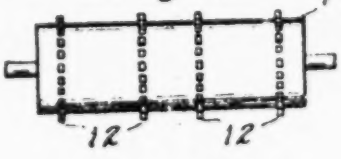


Fig. 6.

Fig. 8.

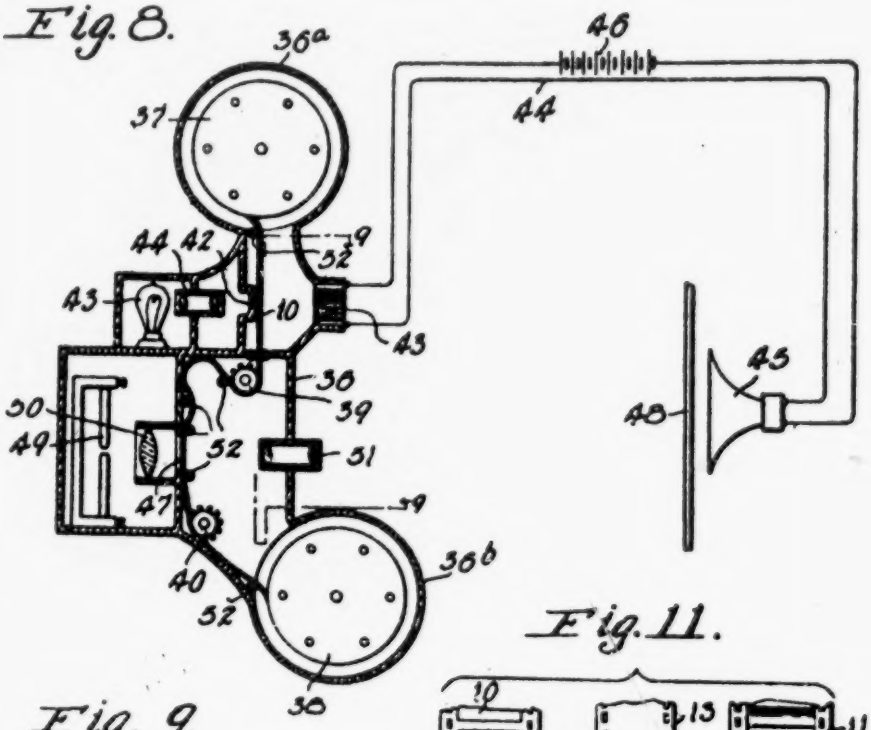


Fig. 9.

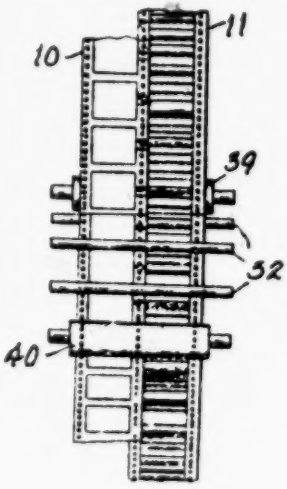


Fig. 11.

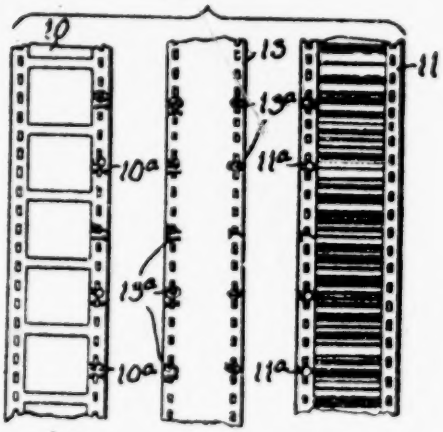
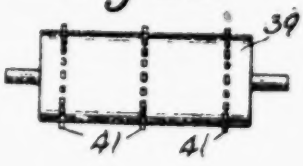


Fig. 10.



2464

Plaintiff's Exhibit No. 37.

Subject Inventions of Messrs. Engl, Massole and Vogt—F. A. Schroeder.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
BELL SYSTEM

Department of Development and Research
195 Broadway

New York Sept. 29, 1925

2465

Mr. F. A. Schroeder,
200 5th Avenue,
New York, N. Y.

Dear Sir:

Your letter of September 8, addressed to the American Telephone and Telegraph Company, regarding the inventions of Messrs. Engl, Massole and Vogt, has been referred to me for attention. If you will send us a complete description of the inventions in question, together with
2466 numbers or copies of the issued patents, covering same, the matter will be given careful and thorough consideration and you will be advised as to the value, if any, of the inventions to this company.

Yours truly,

L. F. MOREHOUSE,
Equipment Development Engineer.

FCB-MW

Plaintiff's Exhibit No. 37. 2467

September 8th, 1925.

American Telephone & Telegraph Company
195 Broadway
New York City.

Attention of the Managing Director.

Dear Sirs:

The object of the letter is to draw your attention to the inventions of Messrs Engl, Massole & Vogt owned by the Tri-Ergon Ltd, Zurich, Switzerland covering the field of Photo Electric 2468
Sound Recording and Reproducing; Acoustic film, Gramaphone, Radio Broadcasting Device and Loud Speaker as marked copy of American Cinematographer containing short outline.

Yours very truly,

TRI-ERGON, LTD.

Encl.

September 30th 1925.

Mr. L. F. Morehouse 2469
Dept of Development & Research
American Telephone and Telegraph Company
195 Broadway
New York City

Subject: Inventions of Messrs Engl et al

Dear Sir:—

Responding to your favor of 29th inst., we have instructed our attorneys Messrs. Ward, Crosby and Smith, 223 Broadway, to furnish you with the informations desired.

2470 *Plaintiff's Exhibit No. 37.*

Complete apparatus will arrive in this country within a short time, it will afford us great pleasure to have you then inspect same.

Yours very truly

TRI-ERGON, LTD.

October 1, 1925.

2471

American Telephone & Telegraph Co.,
195 Broadway,
New York, N. Y.

Attention of Mr. L. F. Morehouse,
Equipment Development Engineer.

Dear Sirs:

Mr. F. A. Schroeder of 200 Fifth Avenue has called our attention to your letter to him of
2472 September 29th referring to inventions on talking moving pictures, etc. of Messrs. Engl, Vogt and Massolle.

The Radio Corporation has expressed an interest in these inventions and information bearing on the same is now in their hands. We understand that they are acting on behalf of themselves, the G. E. and Westinghouse.

We understand that you are included in the cross-licensing agreements with these companies and presume that, therefore, you can readily obtain access to the records which we have placed in their hands. If we are mistaken as to

Plaintiff's Exhibit No. 37. 2473

this, however, and you would like to have information for your own company directly, please advise us.

I may say that the inventions in question include a number which are collateral to the talking moving inventions and which might be of interest to you, such as an improved microphone of the ionized air gap type, improved loud speaker inventions of the condenser telephone type, etc.

Kindly advise if we can be of any further service to you in the matter. 2474

Yours very truly,

DS.AM

Copy to Mr. Schroeder

Subject: Inventions of Messrs. Engl, Vogt and Massolle.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
BELL SYSTEM

Department of Development and Research 2475
195 Broadway

New York, October 10, 1925.
October 1—30896

Messrs. Ward, Crosby and Smith,
233 Broadway,
New York City.

Gentlemen:

This is in reply to your letter of October 1, relating to the inventions of Messrs. Engl, Vogt and Massolle.

2476 *Plaintiff's Exhibit No. 37.*

I was not aware until the receipt of your letter that the General Electric Company was investigating these inventions and had expressed an interest in them.

As the General Electric Company is not acting in our behalf, we should receive directly such information as we need for our investigation. This information should be a description of the inventions, together with the numbers or copies of such patents as have been issued concerning
2477 them, and such applications and other information relating to inventions not yet patented as your client feels free to disclose to us.

Yours very truly,

L. F. MOREHOUSE,
Equipment Development Engineer.

LFM-BMW.

October 14, 1925.

2478

American Telephone and Telegraph Company,
195 Broadway,
New York, N. Y.

Attention of Mr. L. F. Moorehouse, Equipm't Developm't Engr.

Re Inventions of Engl, Vogt and Massolle

Dear Sirs:

We have received your favor of October 10th saying that you would like to receive directly

Plaintiff's Exhibit No. 37. 2479

such information as you need for your investigation of these investigations.

We are ordering the necessary copies of patents, etc. and will send the same to you as soon as they arrive. These papers will comprise copies of the U. S. patents already issued, copies of certain pending U. S. applications and copies of foreign patents with translations corresponding to other pending U. S. applications and also a short description of the system showing the positions of the various inventions in the system.

It will probably be about a week before this data is at hand when we will forward it to you. 2480

Yours very truly,

DS.AM

Copies to Mr. Schroeder,
Mr. Schwenterley,
Tri-Ergon.

October 29, 1925.

2481

American Telephone & Telegraph Co.,
195 Broadway,
New York, N. Y.

Attention of Mr. L. F. Moorehouse, Equipm't Developm't Engr.

Re Tri-Ergon, A.-G., (Engle, Vogt and Massolle) Inventors

Dear Sirs:

In further answer to your favor of October 10th and referring to our letter of October 14th, we now have the data in hand to give you the

2482 *Plaintiff's Exhibit No. 37.*

information in regard to our clients' system and inventions. We believe these papers will be sufficient for you to get a preliminary knowledge of the Tri-Ergon U. S. cases.

We enclose copies of the U. S. patents which have issued to date and also German patents with translations and British patents, which correspond more or less to various U. S. applications which are still pending. We will, of course, show you the U. S. files themselves later, if the matter develops in a sufficiently satisfactory manner.

2483

We hand you herewith:

1. Copy of a memo sketching the situation.

2. U. S. issued patent 1,534,148 covering pick-up or microphone, which is termed the "Kathodophone". There are several additional applications covering details of construction, etc. which we probably can show you later.

3. Copies of U. S. patents 1,557,678, Engl, *et al.*, and 1,558,032, Massolle, *et al.*, both dated October 20, 1925, covering the resistance coupling hook-up and high frequency transformer hook-up for the system.

2484

4. German patents 368,367, 368,368 and 368,-369 with translations corresponding to our pending application which is now in interference with DeForest patent 1,482,119, covering the glow light discharge recording system.

4a. German patent 369,075 with translation corresponding to pending U. S. case on detail

Plaintiff's Exhibit No. 37. 2485

of the glow light discharge tube, but not describing and illustrating same very completely.

5. German patents 387,058, 389,317, 389,318 and 389,319 with translations corresponding to pending U. S. case on mechanical features of *the film feed, etc.*

5a. German patent 368,383 with translation corresponding to U. S. application on making sound and picture negatives separately, developing separately and then printing on the same film. We are trying to obtain an interference with a DeForest patent on this, our application being earlier than his date. 2486

6. U. S. issued patent 1,512,681 covering process of making the positive films from the negative sound record films, to effect certain corrections.

7. U. S. issued patent 1,550,381, Aug. 18, 1925, on one form of the condenser telephone loud speaker. We have three pending applications covering other forms of this device, having different methods of avoiding resonance troubles by distributing the natural rates of vibration widely throughout the acoustic range, some of these being particularly adapted for radio loud speakers without horns. 2487

8. British patent 157,433 somewhat corresponding to a pending U. S. case on the use of the photo-electric cell, etc.

9. British patent 157,434, covering combination of photo-electric cell with condenser telephone loud speaker, etc. corresponding to a pending U. S. application.

2488 *Plaintiff's Exhibit No. 37.*

MISCELLANEOUS FEATURES

10. German patent 369,074 with translation. This corresponds partially, with incomplete illustration, to a pending U. S. application on amplifier tube with multiple step amplification with a single cathode.

11. German patent 350,506 with translation corresponding to pending U. S. case on differential h. f. circuits controlled by photo-electric cell.

2489

12. German patent 353,644 with translation corresponding to U. S. case on h. f. circuits. I note the U. S. Examiner considers the last two cases as quite broadly new.

13. German patent 350,586 with translation, corresponding to pending U. S. case covering an amplifier tube with an anode screening electrode with a higher potential than the working anode.

2490

14. German patent 350,999 with translation corresponding incompletely to pending U. S. case covering hook-up with positive bias on grids.

15. Copy of our patent No. 1,555,301, dated Sept. 29, 1925, on parallel connection of glow light discharge tube with amplifier.

16. German patents 350,705 and 350,706 with translations partly corresponding to pending U. S. case and describing sound recording system of the vibrating mirror type.

Plaintiff's Exhibit No. 37. 2491

17. British patent 177,534 corresponding to pending U. S. case covering a phosphorescent screen method of sound recording.

18. German patent 392,188 with translation corresponding to U. S. pending application covering sound recording system in which cathode rays pass out from a cathode tube and act directly upon the moving film to make a photographic record corresponding to the sound.

19. German patent 350,709 with translation corresponding to a pending U. S. case covering the idea of having the kind of light, the kind of photo-cell and the kind of emulsion on the film all correspond in sound reproducing. 2492

20. U. S. patent No. 1,555,281 dated Sept. 29, 1925 covering method of making gramophone disc records involving the use of the ionized air gap pick-up and other features.

21. Two pending applications A-19a and A-19b cover improvements in regard to the method of directing the light rays through a slit before they fall upon the film in both recording and reproducing, and also covering improvements in the light source for reproducing. In DeForest the film passes immediately behind the metal piece in which the slit is formed so that this slit picks up rust, etc. and causes imperfections in the recording and reproducing. This is entirely overcome by our method and I can give you details later. 2493

22. U. S. Case A-41, I have no corresponding foreign patent at hand but can let you have this application later. It covers arrangements for

2494 *Plaintiff's Exhibit No. 37.*

overcoming the difficulty caused by the negative voltage curve of the glow discharge tube in combination with the amplifier and also covers various details and combinations in connection with the glow discharge tube recording device and the amplifying tubes, etc.

Quite a number of the pending applications referred to above have been allowed and various others are almost completely allowed. The pending U. S. cases describe, illustrate and claim
2495 the inventions much more fully in most cases than the corresponding foreign patents.

Yours very truly,

DS.AM
encls.

WARD, CROSBY & SMITH.
233 Broadway,
New York

10/29/25

2496 MEMO RE TRI-ERGON CONSTRUCTIONS

1. In recording sound we use a construction covered by our Patent 1,534,148, April 21, 1925, known as the Kathodophone. This enables the sound to acoustically modulate the current in a circuit without mechanically moving any parts whatever and in a manner which quite avoids inertia by causing the sound vibrations to travel directly into an ionized air gap extending between an anode and a cathode, the latter being preferably heated by a separate battery.

Plaintiff's Exhibit No. 37. 2497

We also have applications pending on details of this construction.

The acoustically modulated current is amplified and feeds glow discharge tube of the character of the Gehreke tubes. The cathode glow produced in this tube is varied in intensity of illumination by the acoustically modulated current and this light of varying intensity passes through a slit on to the moving film and thus makes a sound record in the form of transverse lines of varying density.

2498

Our main application on this glow discharge tube recording is involved in interference with DeForest Patent 1,482,119. This interference has not yet reached the stage of taking testimony and will take quite a time before final decision, probably. Our chances of success seem excellent for various reasons, among them being that we have a filing date abroad considerably earlier than DeForest here and it is exceedingly doubtful that DeForest made any actual reduction to practice before our filing date. His construction as shown and described is not commercial and does not show any clear understanding of the matter, and we believe it to be inoperative, as described.

2499

We also have pending applications covering various useful details of this construction with allowable claims. The amplifier tubes are connected by resistance couplings, as well as are other elements of the system in order to prevent the recording and reproducing being affected by extraneous sounds such as those produced by the adjacent moving picture apparatus motor, etc., and we have two patents directed

2500 *Plaintiff's Exhibit No. 37.*

to this idea which have been issued, Nos. 1,557,-678 and 1,558,032.

A difficulty of the DeForest apparatus consists in the fact that the film moves in contact with the plate in which a fine slit is arranged through which the light passes and this slit picks up dust, etc. We have pending applications covering a slit arrangement which is a great improvement over the prior art, containing presumably allowable claims. By this ar-
2501 rangement all of the acoustic frequencies may be recorded clearly on the film without overlapping. We can give details of this construction when needed.

The negative sound record having been made on the film, certain inaccuracies are apt to arise in the developing and printing of the positive film therefrom. These inaccuracies in the photographic process are overcome in the method described in our Patent 1,512,681, October 21, 1924, which involves an overdevelopment of the negative and a corresponding correction in the
2502 printing, as a result of which the density of the print will correspond more accurately to the variations of the illuminating intensity of the recording light.

In reproducing, light from a constant source passes through a positive film and falls on a photoelectric cell of an alkali cathode type and produces modulated current which is amplified and affects a condenser telephone type of loud speaker which does not require any horn. We have various applications on combinations of the photoelectric cell with various other elements of the system, these being thought to be

2503

patentably novel when applied to a sound reproducing system a number of years ago, when the first applications were filed.

The condenser telephone loud speaker is covered by various applications, one of which is now issued, Patent 1,550,381. These cover methods for doing away with the improper reinforcement of various tones by resonance. This is accomplished by constructions such that the diaphragm will have no natural frequency as a whole, various frequencies being reinforced throughout the acoustic range and a proper damping factor being provided to flatten the resonance peaks thus produced so as to produce a sound curve substantially parallel to that of a diaphragm having no resonance points at all within the acoustic range.

2504

The Company has quite a number of U. S. applications pending, over thirty as I remember, covering various features used and also covering various structures and methods which are not actually used commercially by us, quite a number being allowed.

2505

We also have a patent No. 1,555,281, dated Sept. 29, 1925, on a method of making sound record discs or phonograph records in a manner free from inertia which involves some of the principles covered by some of the patents and applications above referred to.

We also have applications pending specifically covering loud speaker construction particularly for radio uses which is of the condenser telephone type, with no natural frequencies or resonance points.

WARD, CROSBY & SMITH.

2506 *Plaintiff's Exhibit No. 37.*

Subject: Inventions of Engl, Vogt and Massolle

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
BELL SYSTEM

Department of Development and Research
195 Broadway

New York, November 5, 1925
October 29—31482

2507 Messrs. Ward, Crosby and Smith,
233 Broadway,
New York, N. Y.

Dear Sirs:

I have your letter of October 29 with the enclosures listed therein relating to certain inventions of Messrs. Engl, Vogt and Massolle which we shall be glad to investigate with a view to determining what interest, if any, this company may have in them. I note that items 21 and 22
2508 in your letter relate to pending applications which you do not include with the enclosures but regarding which you will supply details later. As soon as our investigation in connection with this matter is completed, I shall be glad to advise you as to our conclusions.

Yours truly,

L. F. MOREHOUSE,
Equipment Development Engineer.

CSD:EML

Plaintiff's Exhibit No. 37. 2509

April 28, 1926.

American Telephone & Telegraph Co.,
195 Broadway,
New York, N. Y.

Attention of Mr. L. F. Moorehouse,
Equipment Development Engr.

Re Tri-Ergon, A.-G., U. S. Patent Cases

Dear Sirs:

Referring to our letter of October 29th last 2510
enclosing description of the various inventions owned by Tri-Ergon, will you please advise us whether the American Telephone & Telegraph Co. has come to any decision in regard to being interested in these inventions or any of the same.

Yours very truly,

DS:AM

Subject: Inventions of Engl, Vogt and Massolle.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY 2511
BELL SYSTEM

Department of Development and Research
195 Broadway

New York, May 3, 1926.
April 28-1926—35179.

Messrs. Ward, Crosby and Smith,
233 Broadway,
New York, N. Y.

Gentlemen:

This is in reply to your letter of April 28, concerning certain inventions of Messrs. Engl,

2512 *Plaintiff's Exhibit No. 37.*

Vogt and Massolle, which we are investigating with a view to determining what interest, if any, this company may have in them. In investigating matters of this kind it is often necessary for several departments of the company to consider each invention carefully and, in view of the number of items involved in this instance, we have not yet finished our study. This work is proceeding as rapidly as practicable, however, and you will be advised as to our conclu-
2513 sions in the near future.

Yours truly,

L. F. MOREHOUSE,
R. W. M.
Equipment Development Engineer.

CSD:MM

June 30, 1926.

2514
American Telephone and Telegraph Co.,
195 Broadway,
New York, N. Y.

Attention of Mr. L. F. Morehouse, Equipment Development Engineer.

Re Patents—Engl. Vogt and Massolle

Dear Sirs:

Pursuant to our letter of yesterday another patent of the above inventors, namely No. 1,590,-

Plaintiff's Exhibit No. 37. 2515

185, has now come to hand and same will be forwarded to you as soon as copy comes in.

Yours very truly,

DS:AM

Copy to Mr. Schroeder.

July 8, 1926.

American Telephone and Telegraph Co., 2516
195 Broadway,
New York, N. Y.

Attention of Mr. L. F. Morehouse, Equipment Development Engineer.

Re Patents—Engl. Vogt and Massolle

Dear Sirs:

Referring to our letter of June 30th, patent No. 1,590,185, Engl. *et al.*, has now come to hand and we enclose it herewith. 2517

Yours very truly,

DS:AM
encl.

Copy to Mr. Schroeder

2518 *Plaintiff's Exhibit No. 37.*

July 29, 1926.

American Telephone & Telegraph Co.,
195 Broadway,
New York, N. Y.

Attention of Mr. L. F. Morehouse, Equipment Development Engineer.

Re Inventions of Engl. Vogt and Massolle

2519 Dear Sirs:

Your letter of July 15th received.

This is to enquire when you expect to complete your investigation of this matter if it has not yet been completed. We would be glad to hear definitely from you whether you are interested in this proposition.

Yours very truly,

DS:AM

2520 Copy to Mr. Schroeder

Plaintiff's Exhibit No. 37. 2521

Subject: Inventions of Engl, Vogt and Massolle.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
BELL SYSTEM

Department of Development and Research
195 Broadway

New York, Aug. 4, 1926
7/29/26—37232.

Messrs. Ward, Crosby and Smith, 2522
Woolworth Building,
233 Broadway,
New York, N. Y.

Gentlemen:

This is to acknowledge receipt of your letter of July 29, in which you inquire as to when we may expect to complete our investigation concerning the Engl, Vogt and Massolle inventions. Our work in this connection is going forward as rapidly as practicable and it now seems 2523
likely that it will be completed in about five or six weeks, when we shall be glad to advise you concerning our conclusions.

Yours very truly,

L. F. MOREHOUSE,
Equipment Development Engineer.
C.S.D.

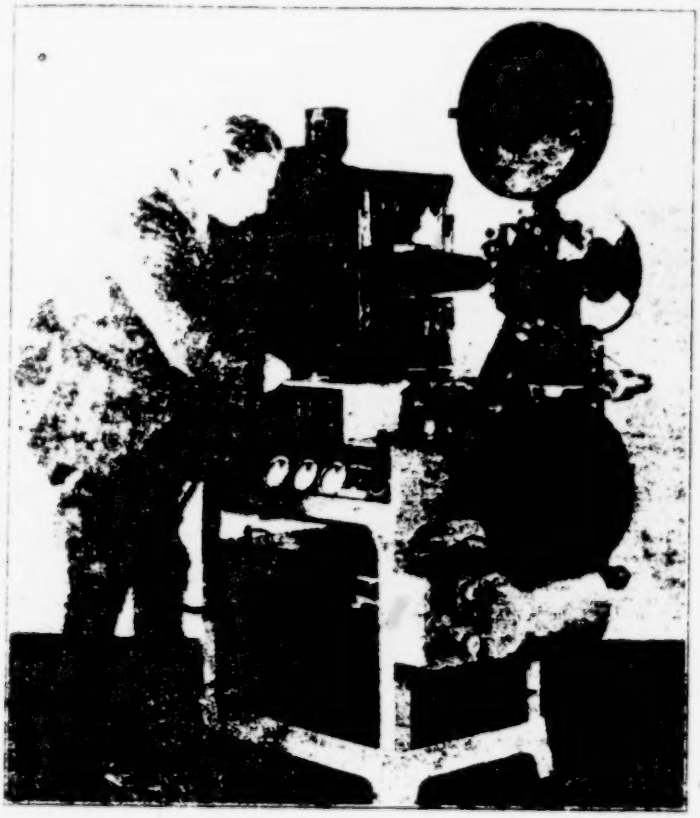
CSD:ML
MLM

PLAINTIFF'S EXHIBIT No. 38

Announce New "Talking Pictures"

By G. Pupikofer

Acoustic Triergon Film Given Extensive Trials *for* Testing *on* Continent



Left—Picture A, illustrating the projector for the new "talking pictures."

Above—Picture B, the auxiliary loud speaker, which is placed near or behind the projection screen, and produces the sound that gives the audience the illusion of the talking and musical film.

5800
United States District Court
Eastern District of New York,
04 Exhibit 38 in evidence
Date Dec 5/31
Clerk
Deputy Clerk

It is well known that for many years attempts have been made to solve the problem of the acoustic film by the aid of the gramophone. These efforts, however, did not yield any satisfactory result, in spite of the fact that no less a person than Mr. Edison occupied himself with the matter. Apart from the defective reproduction of speech and music by the gramophone, the temporal concordance of picture and sound, i. e., the synchronism, was not obtained. Very often, the artist on the screen had already closed his lips before the last tones were audible from the gramophone horn.

The Triergon system does away with the gramophone. The cinematographic picture and the phonogram here form an organic unit, both being photographed on the same reel. At the outset there were considerable technical difficulties experienced in carrying out the Triergon system, seeing that it was intended to transform the feeble energy of the sound-waves into electrical impulses. These electrical impulses had to be transformed into light for the purpose of photographing them on the reel. The latter is then developed and copied, and the acoustic film is reproduced. An analogous proceeding had to be carried out in the reverse direction, i. e., light had to be converted into electricity and the latter into sound, so that the same tones issue as are heard by the human ear when making the record.

The acoustic Triergon Film, popularly known as the "talking film" is the result of seven years' work on the part of three inventors, J. Masselle, H. Vogt and Dr. J. Engl. The Tri-Ergon Co., Ltd., Zurich, a Swiss Company with a paid-up capital of two million Swiss francs, is the owner of the invention with all the patents appertaining thereto. The company manufactures and supplies all the necessary apparatus. The acoustic films themselves are made by the licencees of the company and utilized under license. The Universum Film Co., Ltd., Berlin (Ufa) recently acquired the license for German-speaking countries. The Tri-Ergon

(Continued on Page 17)

New "*Talking Pictures*"

(Continued from Page 31)

Co. have retained all rights for other countries, and is represented in New York by F. A. Schroeder.

Although the older arts of telephony and photography had already given birth to a number of valuable apparatus, such as microphones, electric amplifiers, loud speakers, etc., it was gradually found that the existing apparatus were insufficient for the talking film. Hence a large number of special technical problems had to be solved anew. Large sums of money, considerable inventive and technical skill and valuable time were expended with this object.

Before treating this path of development more closely I should like in this place to mention some of the practical commercial results of the Triergon system, as they throw more light on the degree of perfection attained by this system than any technical explanations can do. In order to demonstrate the technical reliability of the apparatus, their convenience when traveling, the quality of their representations and their power of attracting the public, a tour was organized last winter in the Rhineland at the request of several parties. The apparatus No. 18 traveled with a film program of 2000 meters the towns of Cologne, Dusseldorf, Duisberg, Herne, Aachen, Solingen, Bonn, Munich, Rheydt, Oberhausen, Krafeld, etc. These exhibitions continued from November 7th to February 19th, and the results before the

(Continued on Page 18) 35½

thousands who came to see them confirmed the inventors' faith in the apparatus.

First of all a new and properly working microphone had to be created for making the sound record, the so-called "Kathodophone." While microphones heretofore have made their records by mechanical means, such as membranes, carbon granules, etc., the kathodophone obtains perfectly pure sounds the inventors claim. The kathodophone works on an entirely new principle by which the sound exercises a direct influence on the electric current, being conveyed to an iron path which is switched into the electric circuit. As this new kind of microphone does not possess any mechanically moved parts the disturbing self-frequencies which can hardly be avoided in the case of ordinary microphones are eliminated.

The second special task was the creation of an electrical amplifier of the same quality as the kathodophone. The difficulty of this task can be gauged by the fact that all the various sound frequencies had to be amplified a hundred thousand fold, whereas, as is known, the human ear needs between 5,000 and 20,000 frequencies a second.

The third stage in the development of the new film was the production of the so-called "ultra-frequency lamp," a recording lamp sensitive to sound, which transforms the vibrating electric current in the rhythm of the arriving sound-waves into a trembling luminous patch which illuminates the film. The usual sources of light, such as incandescent and arc lamps were found not adaptable for this purpose.

After this preliminary work the production of the picture-sound film record could be proceeded with, i. e., to capture all the sounds and tones simultaneously with the picture being screened. The development of the negatives, too, as well as the copying of the positives, or copies required special study.

Fig. A shows the Tri-Ergon projection apparatus for talking films. The apparatus possesses a contrivance similar to that which has long been used by astro-physicists for determining starriness. This photo cell is distinguished by the fact that it immediately reacts on every light impression with an electric impulse. In addition the projection apparatus has a graded amplifier which may be seen in Fig. A.

The perforation of the acoustic reel is the one universally used, so that the apparatus can also project ordinary films. This has a certain advantage when projecting both kinds of film, i. e., "dumb" and "talking" ones, at the same performance. The Tri-Ergon process is advocated as offering without further ado the possibility of providing any film with suitable accompanying music and thus replacing the expensive kinema orchestras. Instructive films and the like can also be accomplished by the necessary elucidations in any language. It goes without saying, too, that very interesting possibilities are thus opened out to advertising.

Fig. B shows the novel hornless loud speaker, the "Statophone," which is placed near or behind the [illegible]

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Fig. B shows the novel hornless loud speaker, the "Statophone," which is placed near or behind the projection screen, and produces the sound that gives the audience the illusion of the talking and musical film. It is hardly necessary to point out that this new loud speaker is of considerable importance to acoustics, especially as a broadcasting loud speaker.